FLIGHT

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Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1932

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May 28. No. 600, City of London (B) Squadron A.A.F. Display, Hendon Aerodrome.
May 27-28. G.A.P.A.N. Civil Air Display, Brooklands.
May 31. R.A.F. (Middle East) Dinner at R.A.F. Club.
June 4. Henly's Rally and Gymkhana, Heston.
June 4. Bristol Airport Summer Flying Meeting.
June 4. Leicester Ae.C. Flying Display and Motor Gymkhana at Ratcliffe Aerodrome.
June 4-12. Tour de France.
June 7. Junior Ae.C. Dinner at Ham Bone Club, W.
June 11. Close of Royal Tournament, Olympia.
June 12. Herts and Essex Ae.C. Meeting at Broxbourne.
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July 2-3. International Tourist Rally, Rheims.
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July 14. International Rally, Saint-Brieuc.
July 16. Shanklin Air Pageant.
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Aug. 1. Skegness Air Pageant.
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Aug. 19-21. 4th Annual Canadian Air Pageant, St. Hubert, Que.
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EDITORIAL COMMENT

LAST week-end was a very mixed one for aviation. A number of accidents unfortunately marred it, and we are left to mourn the loss of several whose lives can ill be spared. On the other hand, aviation has two notable achievements to its credit, both, as it happened, successful flights across the Atlantic.

Two Flights

The attitude of FLIGHT towards ocean flights in landplanes is already well known. We have maintained—and have occasionally made ourselves unpopular in doing so—that nothing whatever is to be gained by such flights. In 1919 Alcock and Brown showed—and were the first to do so—that with luck and careful preparations it was possible for a landplane to cover the distance over the sea between Newfoundland and Ireland. Since then they have had many followers, and unfortunately many lives have been lost in attempts to emulate the flight of the Vickers "Vimy." But the Atlantic has been successfully crossed a number of times, and presumably there will, for many years to come, be those willing to take the very great risks involved. If they like to do so there is nothing to stop them. So long as the newspapers fill column after column with sensational accounts of "intrepid bird-men" (or women) who gamble with death and win or lose as the case may be, people will be found who will risk their lives for the sake of the publicity upon which they know full well that they can count. If the newspapers were to confine themselves to giving the news of such flights in half-a-dozen lines, we should soon see the end of these futile "stunts."

We have had this week-end an excellent example of the attitude of the news-sheets towards aviation. The solo flight of Miss Earhart in a landplane from Newfoundland to Ireland has been proclaimed in huge headlines and columns of fulsome "stories." The flight of the large Dornier Do.X flying boat, which took place at about the same time, has been dismissed—with a few notable exceptions such as *The Times,* in a few lines, and yet there is no comparison between the significance of the two events.

Miss Earhart is reported to have made the flight for no other reason than that she had long thought she could do it and that the improvements in the technique of flying by instruments has now made fairly accurate navigation possible in poor visibility. Very probably Miss Earhart would never have rested content until she had proved to her own satisfaction whether or not she was, if we may use the expression, " man enough " to do it. That is her affair. She has succeeded, and we may congratulate her on her success. But her flight has added precisely nothing to the cause of aviation, as she herself was careful to point out. Apparently, also, Miss Earhart is in agreement with FLIGHT'S frequent advocacy of the flying-boat type for long flights over oceans.

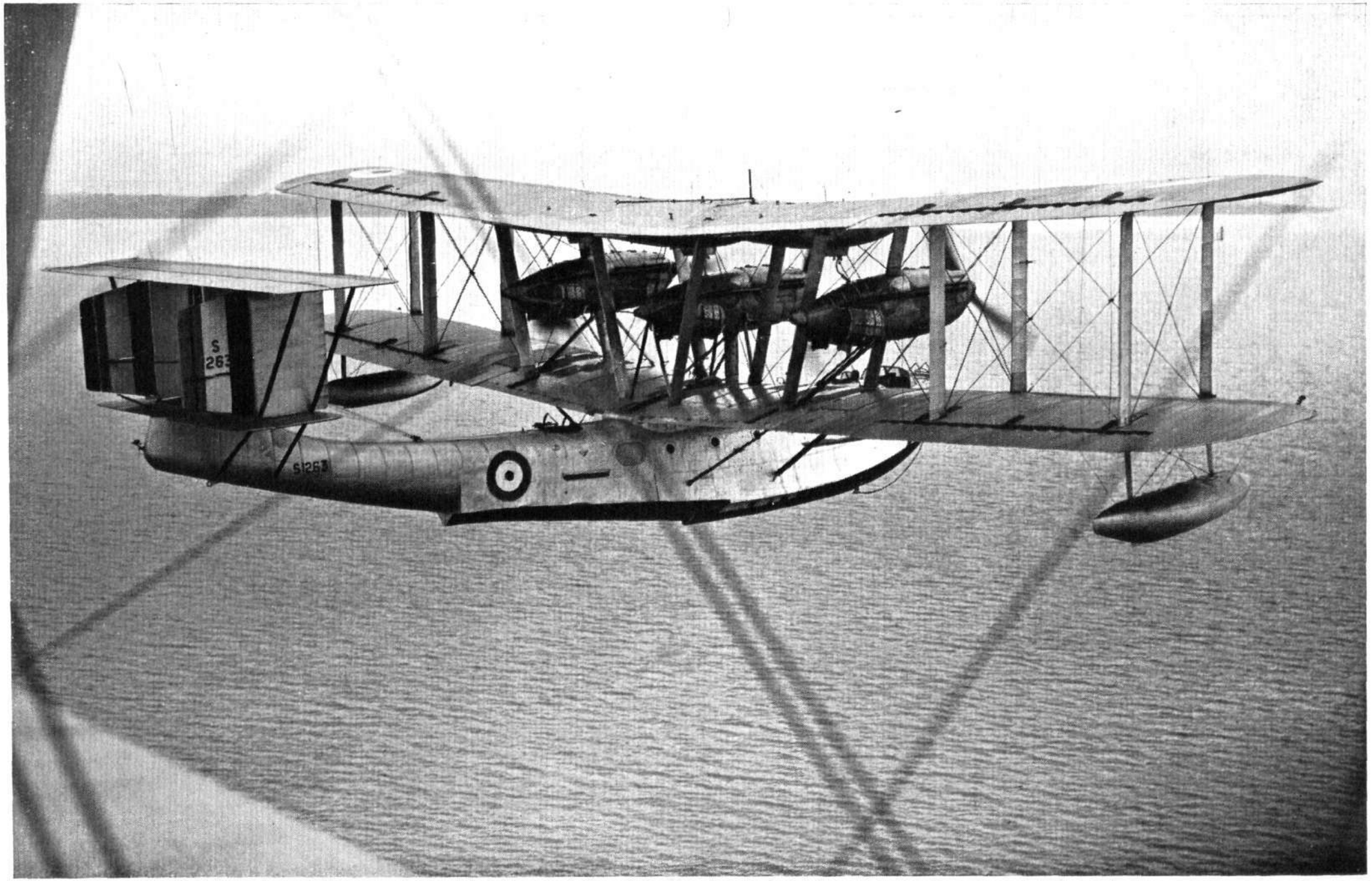
Of exactly this nature is the flight of the Dornier Do.X from Newfoundland to Calshot via the Azores and Spain. Probably no journal in the world has refused more persistently to be blinded by mere size if unaccompanied by other qualities than has FLIGHT. We have pointed out that in this huge machine Dr. Dornier appears to have exceeded what is at present the limit of useful size in aircraft, and that structure weight has become a greater instead of a smaller percentage. If, therefore, we hail this latest flight of the Do.X as a considerable achievement we shall hardly be accused of being prejudiced in favour of the machine. But if the Do.X obtains its disposable load at the expense of very high wing loading, and if its take-off and alighting speeds are such as would make a British designer nervous, and if its take-off run is longer than we in this country are willing to accept as good practice, the machine is at any rate a serious attempt to advance the art and science of flying one step further.

Seaworthiness, other things being equal, is largely a matter of size. A machine like the Saunders-Roe " Cutty Sark is seaworthy in the sort of seaway to be found around our coasts on a large number of days in the year. She would not be regarded as seaworthy in a gale in the Bay of Biscay, for instance. Freeboard plays an important part, using the term to express not only the distance from water to cockpit openings, but also from water-line to the tips of the airscrews. In the Do.X these dimensions are large, and consequently her seaworthiness may be assumed to extend to waves of greater height. During the week-end flight the machine was not, fortunately, called upon to demonstrate her ability in a rough sea. It may be accepted that in what a sailor would call a rough sea she would not have had much chance of getting off again. But she would have been in better circumstances than a landplane compelled to alight under like conditions.

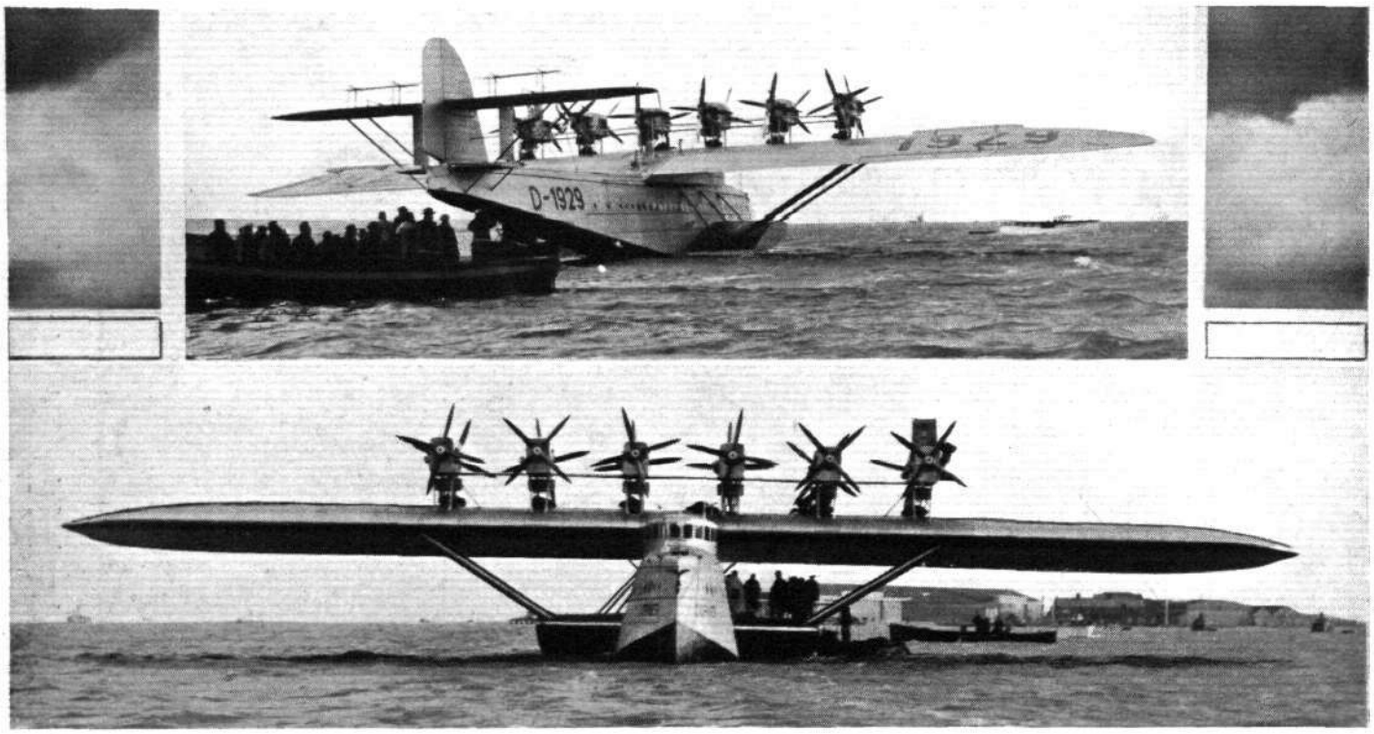
The Do.X had, when she reached Calshot, circumnavigated the Atlantic. She took a long time doing it, certainly, but by no means all the delays on the outward flight and since have been due to technical troubles. The boat, it will be recollected, left Calshot on November 15, 1930 for Bordeaux. Thence she flew, later, on to Lisbon, whence the actual Atlantic flight started on January 31. It is thus a year and a half since the Do.X was last at Calshot, and during that time the machine has met with varying fortune. Sustaining damage at Las Palmas she was held up for a long time, but ultimately the flight to South America was accomplished, and afterwards the machine flew, more or less coastwise, to New York, where she has been laid up until recently.

Her return flight last week-end was rather uneventful, and the ill-luck which pursued her on the outward flight at last seems to have relented. Of difficulties there were a few. Of real troubles none. Refuelling at Newfoundland was difficult because the petrol had to be ferried out to the machine. And the arrival at Horta, in the Azores, was spectacular, because the machine had to alight at sea, in the dark, some distance out and taxy into harbour under her own power, using the searchlight carried on board to find her way. The reports have it that Capt. Christiansen first flew over Horta, but, finding a fair amount of fog through which the lights of the town could be but dimly seen, decided to fly out over the sea again, where he found a clear patch for his alighting. That this great flying boat should have been able to do so and to taxy into harbour, in spite of fog, shows that flying boats of the future may be to a very large extent self-sufficient, and relatively independent of the nature of their shore bases. The Do.X refuelled afloat in a sheltered bay in Newfoundland and arrived in the Azores in dark and fog. Yet she accomplished her journey in safety and without serious mishap of any kind. The final little episode at Calshot might easily have had serious consequences, but it is, perhaps, significant that here again the boat saved herself. When she was in peril of drifting on to the jetty, the starting of one of her engines enabled her to work away from danger.

Altogether the Atlantic flight of the Do.X is an achievement of which not only the Dornier firm but German aviation in general may well be proud. The machine as she stands may not be the last word in large seagoing aircraft, but from her will surely develop, time and money being available, the transoceanic aircraft even better fitted for really serious work. To British aviation, also, the flight of the Do.X will mean a great deal. We in this country have, after a somewhat delayed start, it is true, made the flying-boat type of aircraft particularly our own. We have developed types in which seaworthiness comes before everything else. By a curious coincidence, a picture of the new Blackburn " Iris V " appears on the cover of FLIGHT this week. We have not hitherto seen fit to go quite to such sizes as Dr. Dornier has realised in the Do.X, and the large Supermarine boat, which was already partly built, has had to be scrapped for economic reasons, but that is not to say that the experience which would have been gained will not be available. It is hoped to transfer the experiment from the civil to the service aspect, and the lessons will still be valuable to both sides. When we do build a really large flying boat, it will not be like the Do.X, but Dr. Dornier's experience, as well as our own, will be kept prominently in mind. The result may well be an even greater step forward than was the Do.X in her day.



THE FIFTH AND LATEST: The Blackburn Iris "family" has reached its fifth descendant with the "Iris V" shown here in flight. This is by far the most powerful of these Blackburn boats, being driven by three Rolls-Royce "Buzzard" engines of more than 800 h.p. each. As a result of the extra power the performance is greatly improved, and the machine will maintain flight with any one of the three engines stopped. Another photograph of this machine appears on our cover this week. (FLIGHT *Photo.*)



THE ATLANTIC CIRCUMNAVIGATED : Two views of the Dornier Do.X moored off Calshot. These pictures give a good idea of the height of the propellers above the water line, where they are well protected against spray. The use of the lower wing stumps as boarding platforms is also well brought out. (FLIGHT *Photos.*)

The Do. X Returns

WHEN she reached Vigo, on the coast of Spain, during the afternoon of May 22, the Dornier Do.X flying boat (12 Curtiss "Conqueror" engines) had completed a circuit of the Atlantic. It was on January 31, 1930, that she set out from Lisbon on her outward journey. At Las Palmas she sustained damage which kept her there for repairs until May 1, 1931, when the boat reached Bolama, in Portuguese Guinea. Again a long wait followed, but on June 4 the machine left the Cape Verde Islands, and on June 5 Fernando Noronha, reaching Port Natal, in Brazil, in the afternoon of the same day.

After the Atlantic crossing the Do.X flew to Bahia on June 18, and arrived at Rio de Janeiro on June 20. When visits had been paid to various towns in South America, the Do.X headed for North America, her journey from Rio showing the following dates: Para, on August 8; Port of Spain, Trinidad, on August 19; San Juan, Puerto Rico, on August 21; Miami, Florida, on August 22; Charleston, South Carolina, on August 25; Norfolk, Virginia, on August 26; and New York, on August 27. The stay in America was prolonged by various forms of unpleasantness. The machine was struck by lightning on September 14, but did not sustain any damage. Then the lawyers got to work, alleging some patent infringement, and confiscation was threatened. Over this part of the sojourn in America it were, perhaps, better to draw a discreet veil.

For her return flight the Do.X slipped quietly out of New York on the evening of May 18 and moored for the night in Long Island Sound. The next morning early (5 a.m.) the machine took off for the flight to Newfoundland, which was reached without incident, only to discover that fog made it impossible for the machine to reach St John's, and the refuelling base established there. There was nothing for it but to hunt for some sheltered bay where it should be possible to take on board a fairly large quantity of fuel. Such a bay was ultimately found, but as the fuel had to be conveyed many miles a whole day elapsed in fuelling. However, later in the day the fog cleared and it was possible for the Do.X to reach St. John's and complete her refuelling there.

The long delays prevented a start being made until the morning of Saturday, May 21, when, after a run lasting nearly two minutes, the Do.X managed to get into the air with more than 6,000 gallons of petrol on board. Her gross weight was about 55 tons, which was about the same as at the start of the outward flight last year. For the first five hours or so after the start all went well and the weather was fine The Do.X flew quite low over the sea, as with her great load of petrol there was no point in wasting fuel in gaining height, but she then ran into bad weather, clouds and rain, and climbed to 1,500 ft. to try to get above the rain.

Horta, in the Azores, was reached after dark, and in fog, and Captain Christiansen very wisely decided that to alight under such circumstances would mean running an unjustifiable risk. He, therefore, steered out to sea again and succeeded in finding a clear patch where there was no fog. The great machine was brought safely on to the sea, and proceeded under her own power, and guided by her searchlight, towards Horta, the harbour of which was reached and entered safely and the machine moored.

The next day, May 22, the Do.X refuelled and flew across to Vigo on the west coast of Spain, the flight being made at an average speed of 100 m.p.h. in a strong cross wind. On May 23 the Do.X, after refuelling at Vigo, headed for the English coast, towards which she had to fight her way against a strong north-westerly wind. The machine flew over Calshot about 7.15 p.m. and then headed up Southampton Water to make a circuit of Southampton. Coming back from there the Do.X made another half-turn and alighted into the wind, up Southampton Water. By 7.30 she was ready to moor.

A curious mishap very nearly resulted in serious damage to the boat. In passing the mooring rope to the tender a man fell overboard and the machine, with all her engines stopped, began to drift with wind and tide towards the jetty at Calshot. Frantic efforts by the engineers got one of the Do.X's engines started just in time, and she was able to claw her way to clear water and safety. On her return flight the Do.X carried a crew of 14, including one woman, Mrs. Strassmann.

It had been hoped that there would have been an opportunity for a certain number of English people to make a flight in the Do.X, but this was not found possible, as she was urgently requested to proceed towards home without delay. The machine left Calshot at 10 a.m. on May 24, with Berlin as her next port of call. Flying via Hamburg, Berlin was reached at 6.30 p.m. and the machine moored on the Müggelsee.

Private Flying & Gliding

Society at Heston

THE annual display of the Household Brigade Flying Club was held at Heston on Wednesday, May 18. This meeting has come to be looked upon as one of the chief social functions in the aviation year, and as such it naturally attracts large numbers of people who would not otherwise be interested in aircraft. It was not purely a Garden Party, however, for the flying display was definitely excellent. Some of the demonstrations might perhaps with advantage have been shortened, for a series of aircraft of the same type being shown one after the other is bound to become somewhat tiring, as there is very little which any one pilot can do which is different from the manœuvres of the others.

The programme opened with the final of the "Gwynn Madocks" Cup Competition. This is a landing competition wherein the competitors have to close their throttles at 500 ft. and then land as near to the centre of the aerodrome as possible without further use of their engine. The winner was Mr. J. E. Harrison, Grenadier Guards, who also won the Cup last year. Following this there was a landing competition under similar rules against two members of the Royal Naval Flying Club. Both these competitors suffered from a lack of practice on the Home Aerodrome, so well known to the members of the H.B.F.C., and were beaten by a fairly wide margin of points.

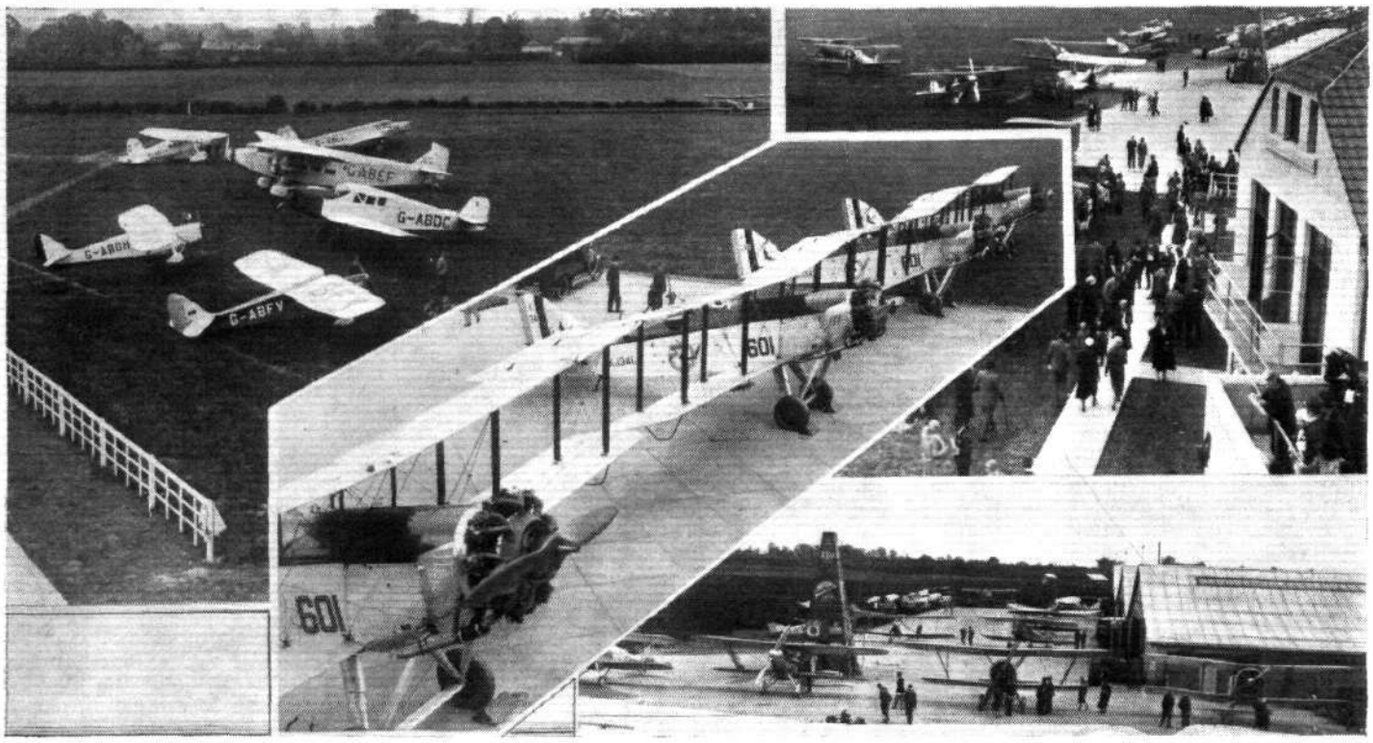
A demonstration of wireless control was somewhat unique, in that four different machines using a light, aircraft wireless receiver of the Standard Telephones & Cables Co., Ltd., were directed as to their movements from the broadcasting equipment on the aerodrome. The machines used were the "Tiger Moth" of the Standard Telephones & Cable Co., the "Puss Moth" of Mr. R. P. G. Denman, the "Moth" of Mr. Ivor McClure, and the "Moth" of Mr. Baillie.

Mr. J. E. Harrison receiving the "Gwynn Madocks" Cup from Air Chief Marshal Sir John Salmond, on the occasion of the Household Brigade Flying Club Meeting. (FLIGHT *Photo.*)

THE PARADE : The tarmac was very fashionable at Heston on Wednesday, May 18, even the funereally-shaped flower beds looked like new season's models with their array of forget-me-nots. (FLIGHT *Photo.*)

F/O. J. F. X. McKenna put up his usual pretty display on a Comper "Swift" (Pobjoy), which, having been fitted for inverted flying, allowed him to do almost everything that can normally be done on any single-seater fighter. After this the military element was emphasised by a fly-past in formation of a flight from No. 601 County of London (Bomber) Squadron Auxiliary Air Force. This flight was composed of Westland "Wapiti" day bombers (Jupiter), and as has so many times been emphasised in FLIGHT, their station keeping and formation flying is as good as that to be seen anywhere.

F/O. A. J. Saint displayed the Gloster Multi-Gun Fighter for the first time at a civil air meeting. With its carefully cowled Jupiter engine this machine has quite a good turn of speed, and although it is a two-bay biplane, is still distinctly manœuvrable. Other high-speed fighting aircraft which gave those present some idea of what the skilled pilot can do in the way of power dives and such-like manœuvres were the Hawker "Fury" (Rolls Kestrel), flown by Flt. Lt. Stainforth; the Fairey "Firefly" (Rolls Kestrel), flown by Flt. Lt. Staniland; and the "A.W.XVI" (Panther III), flown by F/O. A. C. Campbell-Orde. The first two are, of course, somewhat similar in their performance, and, as is well known, it was extremely difficult to choose between them for Service use. The latter, however, is an entirely different machine, for in the "Panther" it has a radial air-cooled engine, and it is probably, though not quite, as fast as the former machines, the fastest radial air-cooled engined single-seater fighter in the world. One thing stood out as most impressive in all these machines, and that was the exceptional speed range which has been achieved in modern design. After dives,



SCENES AT HESTON : On the left are some of the commercial aircraft which were on view—ABGK, Lockheed "Vega" ; ABLI, Spartan Mailplane ; ABEF, Ford ; ABDC, Junkers ; ABDH and ABFV, "Puss Moths." In the centre is the flight of "Wapitis" from 601 City of London (Bombing) Squadron, A.A.F. On the right are views of the tarmac showing the single-seater fighters. (FLIGHT *Photos.*)

in some cases at well over 300 m.p.h., they, one and all, "waffled" across the aerodrome at something below 60 m.p.h. The best display of these fighters was not, however, seen until after the meeting was over, when an impromptu dog-fight was carried out by Staniland and Stainforth in the "Firefly" and "Fury" respectively.

F/O. W. E. P. Johnson did some very pretty inverted flying on the "Tiger Moth," and the way in which he slow-rolled this machine was fascinating to watch. When flying inverted he did not appear to be quite so comfortable as he used to be in the wooden "Moth" G-AALT, but nevertheless there can be few pilots to equal him whatever machine he is flying.

A somewhat amusing, but nevertheless instructive, display was that between Flt. Lt. C. Clarkson in a "Moth," and Mr. R. A. C. Brie in the "Autogiro." Although he tried all he knew, the former was unable to get on the tail of the "Autogiro," as Mr. Brie took full advantage of the capacity of this machine for making rapid flat turns. This has been put forward by many papers as evidence that the "Autogiro" would make an admirable fighting aircraft. If the enemies' fighters were precluded from diving on to it from above or zooming up under from beneath, no doubt this claim might be upheld, but until provision is made for a gunner above the rotor, it is difficult to see how the "Autogiro" could be made invulnerable despite its capacity for turning so rapidly.

Capt. V. H. Baker, the Chief Instructor at Heston, did some hair-raising crazy flying on one of the school "Moths," and his control of the machine should certainly have the desired psychological effect on any pupil who might possibly be nervous as to his instructor's capabilities.

From the civilian point of view, there were many interesting machines there, and although the management had been set back by several cancellations, yet they were able to secure quite a large variety of aircraft. Among those which were demonstrated might be mentioned the "Ford" (three Wasps) and the "Spartan" mail plane (three Gipsy III's), while on the aerodrome besides these there were the "Lockheed Vega" belonging to the executors of the late Lt. Cdr. Glen Kidston, the "Junkers" of Personal Flying Services, and some 35 privately-owned aircraft of various types.

The traffic at the meeting was controlled, as in previous years, by Mr. J. Jeffs on behalf of the Royal Aero Club and the British Aviation Insurance Co. His services and experience would appear to be indispensable at a meeting such as this, where the number of arrivals and departures must approach 200 during the afternoon, for it is only by carefully controlled traffic that safety can be maintained. It is rather surprising that all private owners without exception do not, for their own safety, adhere to the rules on occasions like this, and wait before they are given the signal to take off, and similarly wait until everything is clear before landing. Until the official in charge is given some form of local or police powers he cannot enforce people to obey his signals, and although the majority do so without question, there are still quite a number who presumably unthinkingly take off just when they feel they will. On several occasions we noticed machines did this, and each time they did so when an error of judgment would have caused a serious crash. There has been some talk that the excellent services which Mr. Jeffs rendered last year will not be made use of at meetings again during the coming season. We suggest that there is every reason for continuing this control and, further, would like to see that control continued, not only until shortly after the last event of the meeting, but right on until the visitors have left, for it is during the time when they are leaving that most of the dangerous moments arise.

"The YOUNG VISITER" : A model petrol-driven biplane, constructed by Capt. C. E. Bowden, formed one of the minor attractions at Heston. This model, on Whit-Sunday, established a record for petrol-driven models with a flight of 71 sec. duration. The engine is a Wall two-stroke "hotted-up" by E. Westbury, of Halton. (FLIGHT *Photo.*)

AMATEURS TRIUMPH

AMATEUR pilots undoubtedly triumphed in the race organised by the *Morning Post* from Heston on Saturday last, May 21. The winner himself was a true amateur, who only learnt to fly at Hanworth three years ago, and it is a tribute to his skill as well as to the handicapping of Messrs. Rowarth and Dancy that the finish should have been as close as it was.

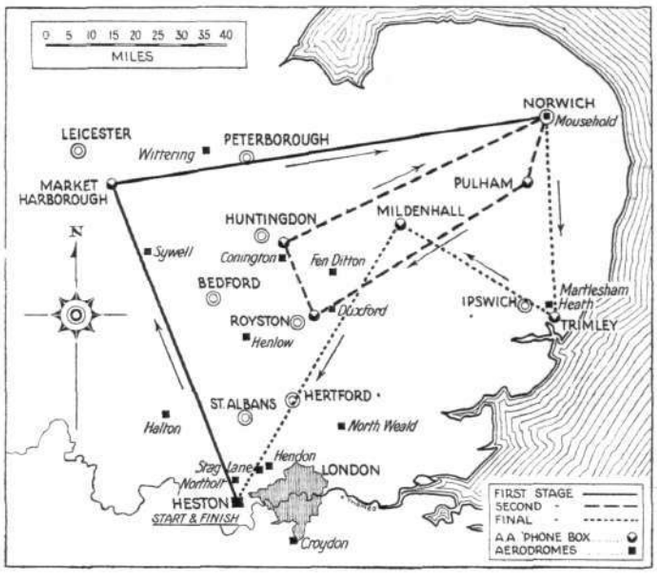
The rules and list of entries for this race have already been published in FLIGHT, and there is, therefore, no need to recapitulate them now. The only alterations to the list which we gave last week were the withdrawals of Capt. Dalgety and Mr. Bradbrooke. This left 30 who were started between 10.30 a.m. and 12.22.17 a.m. in weather which, though not too bad at Heston itself, gave every promise of getting rapidly worse.

The actual start was unique, and attracted great interest, as it allowed considerable scope to the pilots who wished to gain time either at the start or during the race. Behind the aircraft lined up ready to start was arranged a row of tables on which were placed maps and sealed instructions for each competitor. When Capt. Dancy dropped his starting flag the competitor was allowed to open his instructions, plot his courses and get away. Some drew a line in quickly and without further ado ran to their aircraft and took off. Others, as for example Flt. Lt. Stainforth, took much more care, laying off their correct compass courses and making full allowance for wind. That a navigator like Stainforth should think it worth while to "do the job properly" before getting into the air was a fact noted and acted upon by many of the less-experienced pilots starting later.

After the first two or three were away, the start lost much of its interest and excitement, as is inevitable with a handicap race. The only aircraft which was an unusual sight was the privately-owned "Bristol Fighter" (Hispano Suiza) of Flt. Lt. D. V. Ivins, and quite a crowd hung round this machine all the morning—many of the younger generation no doubt wondering what it was.

Those responsible for choosing the course—Messrs. R. P. Denman, Ivor McClure and A. B. Ferguson—had been cruelly efficient, for not only were the routes chosen, devoid of distinguishing marks, but the first leg was on a northerly course. Even when the visibility is good, northerly turning error—that bugbear of the compass designer—creates many difficulties, and when the conditions were like those on Saturday, then a turn-indicator is a necessity if a really accurate course is to be kept. Mr. Walker, it is worth noting, relied on his Reid & Sigrist turn-indicator to a large extent for the race, and was therefore all the more gratified when he received another of these instruments as part of the first prize. He owns a "Moth" and a Comper "Swift," which he keeps at Hanworth, besides his "Puss Moth," and both of these aircraft will probably now be fitted with this aid to navigation, as the result of his experience.

The weather got rapidly worse as the competitors flew north, and by the time they reached Leighton-Buzzard several had decided that it would be wise to retire. Among



A Map of the Course.

these was Maj. J. E. D. Shaw, who unfortunately hit a farm gate in making a forced landing. In doing so he broke the centre-section, which, together with the fuel tank, came back and closed in the rear cockpit, preventing him from getting out. Luckily he was not hurt in any way, and was shortly rescued from his involuntary bath of petrol by Miss Sale-Barker, who had seen his plight from the air and sportingly landed to help him, together with the inevitable farm hand who always appears from nowhere whenever one lands in a field. Miss Crossley, Lord Grimthorpe and Mr. Tony Law were others who all decided that the low cloud and bad visibility made flying too tough for them, and who therefore returned to Heston.

Their deciding to turn back raises many interesting questions, foremost of which is: "How and when can an inexperienced pilot decide that he will be called wise rather than a coward for admitting that the weather has beaten him?" It is the prerogative of adolescence to be foolhardy, and as Capt. Lamplugh will readily admit, it is during the adolescent period in a pilot's experience, namely, round about the 50-hr. mark, that foolhardy risks are so often taken with dire results. A race like this should provide data from which it ought to be possible to formulate some sort of theory as to the weather conditions under which pilots of average ability would be considered justified in giving up. It will be noticed from the table that 17 out of the 30 starters actually finished the course, a high percentage when it is seen that this number is about equally divided between experienced and inexperienced pilots. When making any conclusions, however, it must not be forgotten that the stimulus provided by the fact of it being a race, certainly caused many, who would have otherwise given up, to carry on and finish

The "scratch" man, F/O. E. C. T. Edwards, taking-off on his Hawker "Tomtit" (Mongoose III).
(FLIGHT *Photo.*)

Mr. F. R. Walker, the winner, receiving the Trophy from the hands of Mrs. Shelmerdine ; with this Cup there was also a Reid & Sigrist Turn Indicator—a similar instrument to which Mr. Walker used during the race.

The winner's "Puss Moth" (Gipsy III) arrives in the rain at Heston. (FLIGHT *Photo.*)

Mr. J. Grierson, "Moth" (Gipsy I), arrives at Heston, second, in still heavier rain. (FLIGHT *Photo.*)

Mr. G. Baillie, the third arrival. His "Moth" (Gipsy I) was fitted with a Standard wireless set by means of which he was able to get the weather reports broadcast from Heston during the race.

the course. Apart from the winner, the performances of Mr. G. Baillie, Mr. Gordon Selfridge, Sir Kenneth Crossley, Mr. W. R. Walwin, Mr. R. L. Bowes and the Hon. M. Hachisuka must all be considered as of outstanding merit. This is not meant to belittle the efforts of those other pilots who finished, but only to emphasise the fact that our "A" licensed club-trained pilots of to-day are, when necessary, capable of competing with weather which has been known to beat foreign air-mail pilots.

On the first lap Flt. Lt. Stainforth lost much time owing to having misjudged his fuel consumption, with the result that he had to land and find some more. Despite this, however, he carried on and finished the whole course, a fine effort under such bad circumstances, when he knew he had no chance of getting even a place.

The second leg brought with it a tragedy which marred the race, for our very good friend Flt. Lt. F. G. Gibbons, with whom we have had the pleasure of flying on so many occasions, lost his life by flying into a tree (see page 477). Ironically enough, the visibility had improved greatly, and his death cannot be attributed to that ; he must have flown into the tree when looking at his maps, and we can only hope that his untimely death will serve to stir designers into realising the lack of forward view possessed by the conventional single-engined tractor aircraft. The "Spartan" is certainly as good as any other of this type, but surely the day has come when forward view is as vital a necessity as is speed, reliability, or any of the other points sought after in modern designs.

The final leg led the remaining competitors into even fouler weather, and from Potters Bar to Heston many were flying almost completely blind. Luckily for them, the Southall gasometer—generally a menace—served as a landmark which stood somewhat clear of the surrounding murk, and all showed signs of the greatest relief when they arrived—Flt. Lt. Christopher Clarkson's shout was heard by us in the control tower while he was still landing!

Shortly after Mr. Walker had landed, there occurred a most regrettable incident. Miss Winifred Spooner came in amid much rejoicing, for she is a most popular pilot, and her gaining a second place would have pleased everyone, but she had not fully appreciated the rules, and failed to cross the finishing line in flight. The judges had no

H. E. S. Pritchett, the first man away, spreads out his maps, at the word " Go " ! (FLIGHT *Photo.*)

Flt. Lt. G. H. Stainforth lays off his courses with methodical care under the admiring gaze of Mr. Ivor McClure. (FLIGHT *Photo.*)

option, therefore, but to disqualify her, as they also had to do Mr. Jackaman, some three places later. That two such experienced competition pilots should have failed thus only shows how lamentably true it is that many races are lost through this cause.

Mrs. Shelmerdine presented the prizes, Mr. Walker receiving the *Morning Post* Cup and replica and a Reid & Sigrist turn-indicator ; Mr. Grierson, a Thornton-Norris Air Log ; and Mr. Baillie a set of A.A. aviation maps presented by the British Aviation Insurance Co. Col. F. C. Shelmerdine, the Director of Civil Aviation, thanked the *Morning Post* for organising the race, and congratulated the Editor, Mr. Gwynne, on his paper's air-mindedness. He also expressed appreciation of the part played by Maj. Oliver Stewart and Airwork, Ltd. He expressed his sympathy with Miss Spooner on her oversight, and in conclusion referred to the death of Flt. Lt. F. G. Gibbons, which had, he said, so shocked everyone.

Mrs. Shelmerdine was presented with a bouquet by Miss Margaret Abbott on behalf of the *Morning Post*, and Mr. Gwynne thanked both Col. and Mrs. Shelmerdine for their support.

A talk with Mr. Walker showed what extremely bad conditions he had had to fly through, and we learnt that at no time was he worried by any irregularity in the functioning of any part of his " Puss Moth." The Gipsy III engine ran smoothly throughout, helped, as one would expect, by his standard ignition system, which utilises a B.T.H. AC.44 magneto and K.L.G. sparking plugs. It is also a matter of interest that he did not use a special racing fuel, but just the ordinary National Benzole mixture, which can be obtained from any road-side fuel pump. Six out of the 17 finishers used the same mixture, proving that its peculiar properties are as well adapted to racing as to ordinary work. " Castrol " was the lubricant which also contributed its mite to the success of Mr. Walker's flight, as it has done to the success of so many other pilots.

Pilot	Aircraft	Engine	Left Heston	Arrived Heston	Average Speed	Place
F. R. Walker	Puss Moth ..	Gipsy III ..	12.06.13	18.11.12	108½	1
Miss Spooner	Puss Moth ..	Gipsy III ..	12.13.08	18.20.09	108	disq.
J. Grierson	Moth	Gipsy I	11.35.35	18.18.24	95¼	2
G. Baillie	Moth	Gipsy I	11.09.17	18.20.07	87	3
A. M. Jackaman ..	Moth	Gipsy II ..	11.43.04	18.25.11	95½	disq.
H. G. Selfridge ..	Puss Moth ..	Gipsy III ..	12.11.13	18.27.10	104½	4
H. Bailey	Swift	Pobjoy	12.05.16	18.30.32	101	5
C. Clarkson	Moth	Gipsy II ..	11.38.07	18.40.28	89¼	6
H. C. Mayers	Swift	Pobjoy	12.05.16	18.44.16	96½	7
E. C. Edwards	Tomtit	Mongoose III ..	12.22.17	18.46.54	101	8
K. Crossley	Moth	Gipsy I	11.13.32	18.55.56	79½	9
D. V. Ivins	Bristol Fighter ..	Hispano Suiza ..	11.52.25	19.11.05	85	10
W. R. Walwin	Moth	Gipsy I	11.12.50	19.11.52	76	11
R. L. Bowes	Moth	Gipsy I	11.07.50	19.22.50	73	12
H. E. Pritchett	Redwing ..	Genet II ..	10.30.00	19.24.27	66¼	disq.
G. H. Stainforth ..	Spartan ..	Gipsy II ..	11.10.23	19.47.51	69	13
Hon. M. Hachisuka ..	Moth	Gipsy I ..	11.15.43	20.03.30	67½	14

READING

Night flying is one of the latest innovations at the Phillips & Powis School of Flying, Woodley Aerodrome, Reading. When this was first tried out on Wednesday last it proved to be a very popular form of instruction, and due to the demand which there has been, it has been found possible to keep the rates low ; in fact, the actual charge is very little more than that made for normal dual instruction. The Sales Department have been very busy and during the last week disposed of five machines, two secondhand " Moths," a secondhand " Avian " and " Martlet " and a new Gipsy III " Moth." The extension to the veranda has now made possible the serving of tea in a position which will allow people to overlook the aerodrome, and this will prove of particular attraction on June 18 next, when the Reading Aero Club will be At Home. The President, Lord Northesk, and Lady Northesk will be present on that occasion, while the flying will include a ladies' race and many other interesting items.

BROOKLANDS

During the past few days both the Indian pupils, Mr. Tata and Mr. Gadgil, have passed the tests for their " B " licence. With the help of slightly better weather, over 60 hours' flying were done during the past week. Two pupils, Messrs. Gorton and Forbes, qualified for their " A " licences. Another new " Gipsy Moth " has been purchased and one of the other club machines has been fully equipped with blind-flying instruments and wireless. Pupils of the College of Aeronautical Engineering who received their initial training at the College in Sydney Street, Chelsea, and their practical training at Brooklands Aerodrome, have now formed a club of their own. An aircraft has been placed at their disposal and they already have over 60 members.

The Civil Air Display which is being held on Saturday, May 28, will be the means, it is hoped, of establishing an endowment fund for the Guild of Air Pilots. Flying will commence at 1.30 p.m., at which time the aircraft will start on the London-Newcastle Air Race. The main

The Hon. H. Hachisuka making a speedy get-away. (FLIGHT *Photo.*)

Flt. Lt. D. V. Ivins boarding his privately-owned Bristol Fighter (Hispano). (FLIGHT *Photo.*)

The handicappers (right to left), F. Rowarth and W. Dancy. (FLIGHT *Photo.*)

programme will commence at 3 p.m., and after the usual fly past there will be a demonstration of the Hawker "Fury." There will also be delayed drops by parachutists, which event will be combined with a guessing competition as to the height at which the drop takes place.

Another innovation will be a pylon race by three machines. Two pylons will be within easy but safe distance of the enclosures, while the third will be outside. The races will be composed of six or seven laps.

The commercial aircraft shown at the display will in many cases be those actually used on air routes, and will include the Breguet in which the French pilots Codos and Rolida made a record flight from Hanoi to Paris. There will also be a Concours d'Elegance for visiting aircraft. This is open to all machines on the payment of 5s. entry fee. Visitors landing by air should do so before 3 p.m., as between that hour and 5 p.m. no landing or taking off can be allowed. On landing, pilots should taxy towards the sewage-farm park and report to the kiosk for badges and information. Cars arriving for the 5s. enclosure will enter the track and proceed right-handed around the north side to the back of the club buildings.

HENLYS' RALLY

Henlys' Rally, to be held at Heston Airport on June 4, will be distinguished by the presence of Mr. Mollison and Miss Amy Johnson, who will act as joint presidents of the meeting, at the conclusion of which Miss Johnson will give away the prizes. At the present time there are already some 500 entrants, including those for the aeroplane altitude race, and it may therefore be justifiably felt that the success of the Rally is assured. During the afternoon flights will be available to all those who wish to make them, and particularly for those who wish to fly over to Brooklands to see the finish of the 1,000 miles race.

LANDING AT EASTBOURNE

The field mentioned as being suitable for landing at Eastbourne, in FLIGHT for April 8, is being used for the Sussex Agricultural Show, and will, therefore, be unsuitable for aircraft until the end of August.

LANCASHIRE AERO CLUB CHANGE

After nearly 3½ years as Chief Flying Instructor, Mr. D. E. Hall has left the club and relinquished his post to Mr. G. F. Yuill. Mr. Hall laid no claim to being a brilliant aerobatic pilot, but he was one of the soundest instructors to be found. He never took unnecessary risks, never lost his equanimity, and, moreover, had the uncanny knack of treating his pupil as if that pupil was the most important one he had yet had. Mr. Hall will not be leaving the district, and club members therefore hope that he will continue to be a regular visitor. About the middle of June the club will be organising a flying meeting in the Isle of Man. During this meeting there will be a race consisting of approximately two circuits around the island, a total distance of some 104 miles, in addition to which minor competitions will be staged. The Aero Club have granted permission for this meeting subject to the Air Ministry licence for a landing ground at Castletown. June 18 will most probably be the date eventually fixed, and members willing to help in the organisation are asked to keep the period, June 17-19, free.

The Annual Display of the Scottish Flying Club was held at Moorpark Aerodrome, Renfrew, on May 21, 22 and 23 in "some" rain. "Heracles," the Imperial Airways H.P.42, flew up so that visitors were able to have joy rides in a modern large aircraft. On Saturday there was a display by No. 602 (City of Glasgow) (Bomber) Squadron, A.A.F., in their Westland "Wapitis."

Air Transport

Progress in Dutch East Indies

ONE of the most successful of the airway systems operating outside Europe is that of the Royal Dutch Indian Airways (K.N.I.L.M.) in Java. We described this system in our issue of January 16, 1931, and below we are able to publish the annual report for 1931 of this company—which we have just received from Java per through air mail in 11 days. The report reads as follows:—

General.—In view of current economic conditions throughout the world the K.N.I.L.M. returns for 1931 are quite satisfactory. The number of passengers carried on the regular air services was only 3 per cent. below the figure for 1930 and amounted to 13,430. The specified returns are given below:—

	Passengers.	Goods (in Kg.).	Mail (in Kg.).
Batavia–Bandoeng ..	bi-daily, 4,264	23,775	652
Bandoeng–Batavia ..	,, 4,379	33,372	628
Batavia – Semarang – Soerabaja	daily, 1,648	7,855	3,947
Soerabaja – Semarang – Batavia	,, 1,791	10,354	3,384
Batavia – Palembang – Singapore	weekly, 278	5,506	455
Singapore – Palembang–Batavia	,, 223	1,597	620
Singapore–Medan (from August 5)	,, 35	520	94
Medan–Singapore (from August 5)	,, 37	349	150
Batavia–Palembang (suspended May 1) ..	,, 41	1,524	83
Palembang – Batavia (suspended May 1) ..	,, 54	283	71
Batavia – Palembang – Pakanbaroe–Medan ..	,, 333	5,282	7,143
Medan – Pakanbaroe – Palembang-Batavia ..	,, 347	1,743	1,588
Special and joy flights ..	3,782	—	3
Total	17,212	92,160	18,818

New Lines.—As the accommodation offered on three services exceeded the demand, the separate service between Batavia and Palembang was suspended as from May 1, 1931. The Batavia-Medan line is served by aeroplanes of the type F.XII, having accommodation for 16 passengers, which implies that always sufficient room to and from Palembang is available.

The weekly service Singapore-Medan was opened on August 5, connecting with the Batavia-Singapore line. Due to the financial depression which is felt severely in the Straits and Deli, traffic remained, however, below expectation.

Further extension of the airlines was hampered by the depressed conditions which prevented the Netherlands Indian Government from constructing new landing fields for the time being.

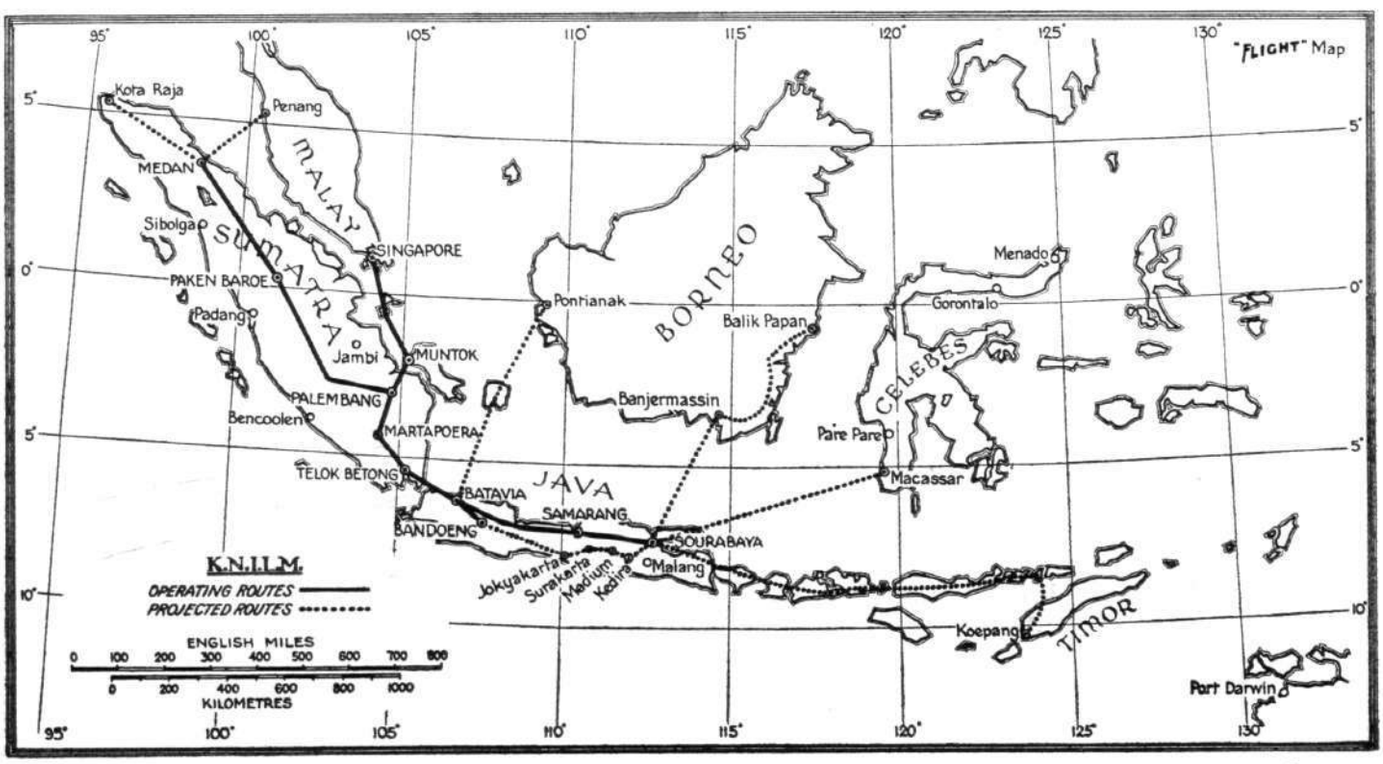
Aircraft: Regularity of Service.—In 1931 two triple-engined Fokker aeroplanes of the type F.XII were added to the fleet, which consisted on December 31, 1931, of: Two Fokker aeroplanes, F.VIIb (three Bristol Titan engines each); five Fokker aeroplanes, F.VIIb (three Armstrong-Siddeley Lynx engines each); two Fokker aeroplanes, F.XII (three Pratt & Whitney Wasp Sr. engines).

The F.VIIb accommodates eight passengers and has a cruising speed of 100 m.p.h.; the F.XII is a 16-seater with an average speed of 120 m.p.h.

2,755 flights were made in 5,677 hours, covering a distance of 919.794 kilometres. The distance covered in Netherlands India since the inauguration of the K.N.I.L.M. totals 2,272,040 km. In 1931 1,030,559 ton/km. were completed.

The regularity of service was 100 per cent. on all services except on the Batavia-Bandoeng line, which shows 99½ per cent. (owing to weather conditions), and the Batavia-Medan service on which it was 98.1 per cent. On this latter service the PK-AFC made a forced landing near Langgam, in Sumatra, on February 14 in very bad weather, by which the aeroplane was damaged. Passengers, mail and goods were uninjured and conveyed to Medan the next day by special plane.

A second aeroplane was damaged during a night landing on August 29, when it struck a kamponghouse in which a large number of natives were present, of whom, unfortunately, two were killed. Both aeroplanes were repaired at Bandoeng.



From May 12 to 27 the K.N.I.L.M. put an aeroplane, a pilot (Mr. Moll) and a mechanic (Mr. Elleman) at the disposal of Mr. Pattist for a flight Java-Australia *vice versa*. This flight was regularly completed as scheduled.

Foreign Aircraft.—On several occasions the K.N.I.L.M. rendered assistance to foreign aircraft flying over Netherlands Indian territory. Besides to a number of private flights, assistance was given to the flight organised by Imperial Airways and which can be considered as a trial flight from England to Australia.

The first flight had an unfortunate untimely end when the *City of Cairo* crashed near Koepang (Timor), due to shortage of petrol.

The second flight schemed by Imperial Airways was cancelled. The outward mail was conveyed by Kingsford Smith from Rangoon to Australia, whereas the homeward mail, originally destined for the second return flight, was flown by Imperial Airways to British India with an aeroplane chartered in Australia.

Assistance was also rendered to the flight of Australian National Airways, in November, of the *Southern Sun* on its way to England.

Passengers.—The reduction of the fare between Batavia and Singapore from F. 185 to F. 140 stimulated the traffic on this line favourably.

The fares between Bandoeng and Semarang and Soerabaja were fixed on the same level as those in force between Batavia and the latter ports, which proved to be a welcome improvement.

A frequent use was made of the air service Batavia-Pakan Baroe for the quickest connection between Java and Sumatra's West Coast.

The Governor-General of Netherlands India travelled by K.N.I.L.M. in May, 1931, on a farewell visit to East Java. Amongst other prominent passengers who patronised the K.N.I.L.M. air services were the Governor-General of the Philippine Islands, the Minister for the Colonies of France and the Lord Bishop of Singapore.

Freight.—As the Bandoeng edition of a prominent Batavia newspaper was printed last year in Bandoeng the regular daily transport of newspapers from Batavia to Bandoeng was somewhat below the figure for 1930. This, taking into consideration the amount of freight carried, shows an increase compared with 1930.

The transport of fresh cut flowers and vegetables from Java to Palembang and Singapore developed favourably as well as that from Bandoeng to Batavia.

Newspapers were carried regularly from Batavia to Palembang, whereas other goods carried on all lines were of the greatest variety—talking pictures, eggs for brooding, one-day old chickens, blood (for medical examination), medicines, butterfly eggs, fresh meat, fish, milk, cream, burners for alpine lamps, engine parts, etc.

Air Mail.—In 1931 twice as much air mail was carried as in 1930. 18,818 kg. were transported, equalling more than 1,300,000 letters.

The weight despatched from Semarang and Soerabaja diminished because in 1930 important quantities of mail were sent in connection with the mail boats departing from Batavia. After the Batavia-Medan service was opened this transport was effected by the latter line, which offered the advantage of a still large time saving (three days).

Although this transport was affected by the inauguration of the weekly service Java-Holland of the K.L.M., it still remains important.

Joyrides.—The specially reduced fare for natives proved to be a great attraction. More than 2,800 natives took part in the joyflights in 1931.

Special Flights.—Although not to the same extent as in 1930, the sight-seeing flights to the craters of the Tangkoeban Prahoe, the Bromo and Tosari, the Sibajak and Brastagi were well patronised.

K.L.M. Holland-Java Airlines.—The activities of the K.N.I.L.M. as head agency for the K.L.M. for Netherlands India increased considerably, and specially after the opening of the weekly service Java-Holland on October 1. All technical work is done by the K.N.I.L.M. at Bandoeng, where the K.L.M. machines are controlled, overhauled and repaired, if necessary.

The average weight of the air mail despatched by each plane remained the same after the opening of the weekly service, which is a very satisfactory result.

Reduction of Fares on Aéropostale

THE Compagnie Générale Aéropostale announce that owing to the present rate of exchange of the £ sterling they have decided to apply the winter rates instead of the summer rates for bookings effected in Great Britain during the present season. Thus a passenger from England can now travel from Toulouse or Marseilles to Casablanca for 1,250 fcs. as against 1,600 fcs. Leaving London by the midday plane and travelling at night by train from Paris to Toulouse he arrives at Barcelona at 7.30 a.m., Tangiers at 1.45 p.m. and Casablanca 3.30 p.m. next day.

African and Indian Air Mails : Times of Posting

THE Postmaster-General announces that, as from May 25, the latest time of posting air mail correspondence for the England-South Africa direct air mail will be 4 p.m. on Wednesdays and for the England-India direct air mail 4 p.m. on Saturdays in the air mail letter box outside the General Post Office, London, and correspondingly earlier elsewhere. Also, the latest time of posting air parcels at the General Post Office, London, for the Sudan, Kenya, Uganda, Tanganyika, Northern and Southern Rhodesia, South Africa and Zanzibar will be 9 a.m. on Wednesdays and for India 9 a.m. on Saturdays.

The Australia-England Air Mail

ACCORDING to the Melbourne Correspondent of *The Times* there has been an interruption in the negotiations between Australian National Airways, West Australian Airways, and Quantas (Queensland and Northern Territory Air Services) for an 18-day air service to England. The reason is the refusal of the Larkin Aircraft Supply Company to undertake the building and repair of machines used in the service on the ground that Mr. Larkin is being given a subordinate position in the scheme. A convention of the smaller airway companies in all the States is meeting in Melbourne, at which action will be taken to demand that if the Government decides to co-operate in a scheme for an air service to England open tenders shall be called for to prevent the subsidised companies from competing at an advantage.

A FOREIGN VISITOR : The Raab - Katzenstein (Siemens) which Herr Max Behland has brought over to Heston. It is understood that he will be giving some aerobatic displays, a form of flying at which he is particularly experienced. (FLIGHT *Photo.*)

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

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CONTENTS

THE STRESS AND DEFLECTION OF UNIFORMLY AND AXIALLY LOADED RINGS.

*By H. L. Milner, Wh.Sc., A.M.Inst.C.E., A.F.R.Ae.S.

By making a simple though not unreasonable assumption, the following article develops a theory of the stresses occurring in a ring of material when loaded in a special manner. On this basis it becomes possible to estimate the maximum stress and deflection in a ring of any cross section.

The results so obtained can, by taking a particular case, be compared with those given by the usual flat plate theory, and it will be seen that the agreement is fairly close for a ring in which the thickness is small compared with the radial width of the section. As the ratio of thickness to width increases the disparity between the two theories diminishes. This is to be expected, because the basic assumption of the present article is that under strain each radial section of the ring rotates through a small angle, and this condition is more likely to be realised in a section having a large thickness to width ratio than in a thin ring.

Consider a circular ring of uniform section carried by a circular support of radius R_1 and uniformly loaded on a circle of radius R_2 as in Fig. 1.

We assume that under this system of loading every radial section rotates through a small angle $\delta\phi$ about some point O in the section. With this assumption we shall see that, in general, the point O will not coincide with the centroid of the section as might at first be expected. However, for the purpose of this investigation the exact location of O is unnecessary. All we need to know is the position of OO_1 where O_1 is the projection of O on to the axis HK of the ring.

In Fig. 2 the full lines represent the section before the load is applied and the broken lines indicate the strained section.

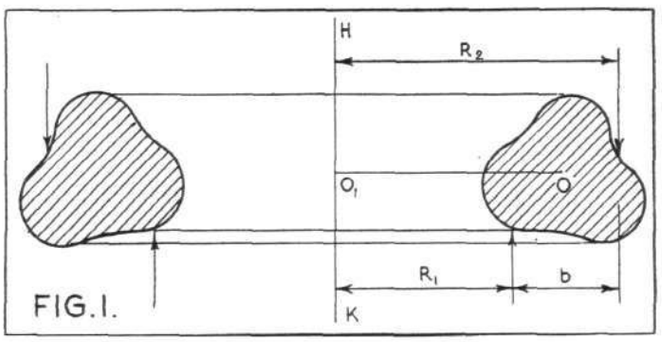


FIG. 1.

Circular filaments of the ring lying in the plane O_1O will not change in length when the ring is strained, but all filaments above the plane will be subject to a tensile strain and below the plane the stress will be compressive.

Take any point P in the section at a radius r from the axis.

Let O.P make an angle θ with O_1O.

If under strain the section rotates through an angle $\delta\phi$, P will move to P_1 where $POP = \delta\phi$.

Let $O_1O = R$.

Let $OP = x$ and the perpendicular from P on to $O_1O = y$.

Before strain the length of the filament passing through P was $2\pi(R + x\cos\theta)$ and after strain the length is $2\pi(R + x(\cos\theta - \delta\phi))$.

Hence the strain of the filament P is

$$= \frac{2\pi(R + x\cos(\theta - \delta\phi)) - 2\pi(R + x\cos\theta)}{2\pi(R + x\cos\theta)}$$

$$= \frac{x(\cos(\theta - \delta\phi) - \cos\theta)}{r}$$

$$= \frac{x\sin\theta\cdot\delta\phi}{r} = \frac{y\delta\phi}{r} = e \quad \ldots\ldots\ldots\ldots \quad (1)$$

Since $\delta\phi$ is a small angle and $= R + x\cos\theta$,

Let p be the circumferential stress in the filament passing through P, then

$$p = Ee$$

$$= \frac{Ey\delta\phi}{r} = E\tan\beta\cdot\delta\phi \quad \ldots\ldots \quad (2)$$

E being Young's modulus for the material of the ring and β the angle PO_1O.

* Mr. Milner has for many years been a member of the Technical Staff of the Gloster Aircraft Co., Ltd., and has specialised, particularly the last few years, on the development of the Gloster-Hele-Shaw Beacham Variable Pitch Propeller.

An element of the ring bounded by two radial planes and subtending a small angle $\delta\alpha$ at the axis must be in equilibrium under the external forces acting on the element, and the sum of the forces acting on the faces AD and BC, Fig. 3.

A little consideration will show that there can be no tangential forces on these faces, for suppose that on an elementary area δs at Q, Fig. 2, there is a tangental force q. This implies that on the adjacent section corresponding to Q there will be a force of $-q$, but since the bundle of filaments represented by Q is symmetrically loaded, the stress at any point in the bundle must be similar and of the same sign as at Q. This condition can only be satisfied if $q = 0$.

We have, then, in considering the equilibrium of the element, to deal only with the resultant of the normal forces on AD and BC.

$$\sin\frac{\delta\alpha}{2} = \frac{\delta\alpha}{2}$$

The external force acting on the element of the ring in the direction HL is zero.

Therefore the resultant of the forces acting on the faces AD and BC in the same direction must be zero,

$$\therefore F = 0 \quad \ldots\ldots\ldots \quad (5)$$

$$\text{Hence, } \Sigma\frac{y}{r}\cdot\delta a = 0 \quad \ldots\ldots\ldots \quad (6)$$

$$\text{and } \Sigma \tan\beta\cdot\delta a = 0 \quad \ldots\ldots\ldots \quad (7)$$

The condition imposed by equation (5) fixes in the section the position of the line O_1O and it will be readily seen that, except in sections possessing a plane of symmetry normal to the axis HK, O_1O will not necessarily contain the centroid of the section.

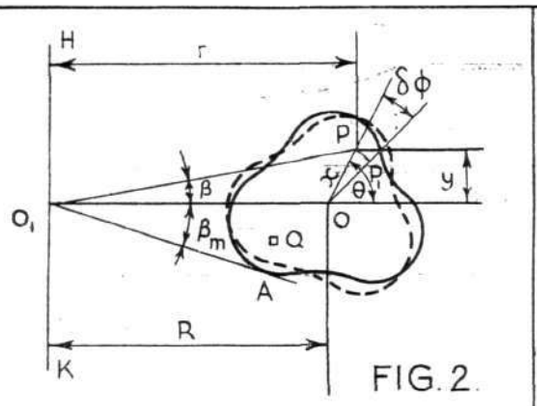


FIG. 2.

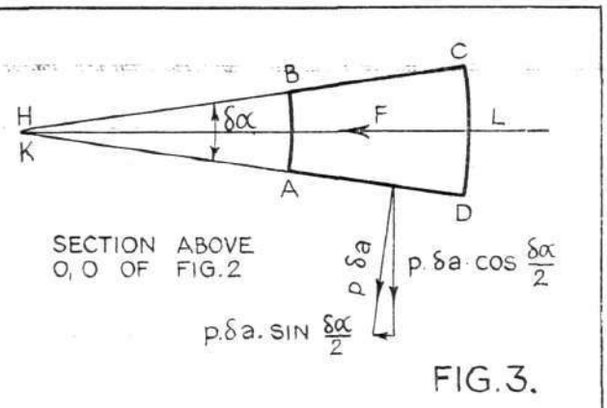


FIG. 3.

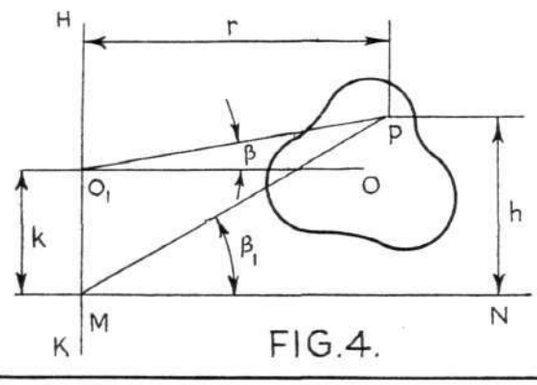


FIG. 4.

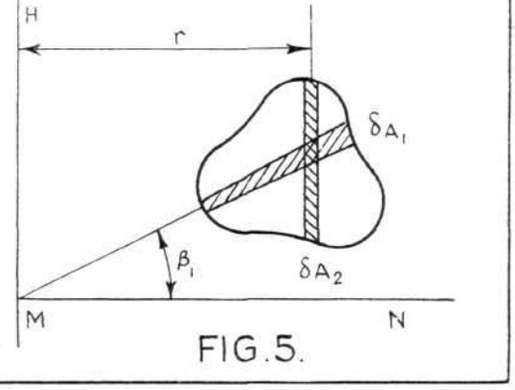


FIG. 5.

Returning to equation (2), the normal force acting on a small area at δa at P is

$$p\cdot\delta a = \frac{Ey}{r}\cdot\delta\phi\cdot\delta a$$

Resolve this force into two components parallel and perpendicular to the mean radius HL. These are:—

$$(a)\ p\cdot\delta a \sin\frac{\delta\alpha}{2} \quad \ldots\ldots\ldots \quad (3)$$

$$(b)\ p\cdot\delta a \cos\frac{\delta\alpha}{2} \quad \ldots\ldots\ldots \quad (4)$$

Taking the sum of the radial forces on AD and BC, the first component (a) results in a total radial force F on the element where

$$F = 2\Sigma p\cdot\delta a \sin\frac{\delta\alpha}{2}$$

$$= 2\Sigma\frac{Ey}{r}\delta\phi\cdot\delta a \sin\frac{\delta\alpha}{2}$$

$$= E\delta\phi\cdot\delta\alpha\Sigma\frac{y}{r}\cdot\delta a$$

since $\delta\alpha$ is a small angle and therefore ultimately

For the centroid to lie in O_1O we must have

$$\Sigma y\cdot\delta a = 0$$

But, in general, $\Sigma y\cdot\delta a$ will have a value different from $\Sigma\frac{y}{r}\cdot\delta a$, and it is the latter sum that must be equated to zero to establish the equilibrium of the element.

Now the value of $\Sigma\frac{y}{r}\cdot\delta a$ obviously depends upon the position of O_1O which for the present purpose must be chosen so that equation (6) is satisfied.

In practice this result may be obtained as follows:— Take any line MN as in Fig. (4) normal to the axis HK and consequently parallel to O_1O. Let k be the distance MO_1. Consider a small area δa at P and let $PO_1O = \beta$, and $PMN = \beta_1$. The distance between P and MN being h we have

$$\tan\beta = \frac{h-k}{r},\ \tan\beta_1 = \frac{h}{r}$$

$$\therefore \Sigma\tan\beta\cdot\delta a$$

$$= \Sigma\frac{h-k}{r}\delta a = \Sigma\tan\beta_1\cdot\delta a - k\Sigma\frac{1}{r}\cdot\delta a = 0 \quad \ldots \quad (8)$$

Each of the two terms of (8) can be readily evaluated as described below. From (8) we obtain

$$k = \frac{\Sigma \tan \beta_1 \cdot \delta a}{\Sigma \frac{1}{r} \cdot \delta a} \quad \ldots\ldots\ldots \quad (9)$$

and hence the position of O_1O is determined. The process of finding k is facilitated by dividing the area into strips as indicated in Fig. 5. Thus, divide the area into a convenient number of parts by radial lines drawn from M. Take the angle β_1 which the centre line of each elementary area makes with MN and multiply by the corresponding δA_1. Treating each radial strip in this manner and adding the products we obtain $\Sigma \tan \beta_1 \cdot \delta a$. Now divide the area into a number of strips parallel to the axis HK. Measure the area of each strip and divide by the mean radius of the strip. The sum gives $\Sigma \frac{1}{r} \cdot \delta a$. From the values thus found we obtain k by equation (9).

Returning to equations (3) and (4) each component (b) on the face AD is opposed by a similar force on the face BC, and therefore has no effect on the equilibrium of the element; but components of type (a), although their sum is zero, have a moment about O and the moment of the component force acting on δa at P is

$$p \cdot \delta a \cdot y \cdot \sin \frac{\delta \alpha}{2} = \frac{E \cdot y^2 \cdot \delta \phi \cdot \delta a \cdot \delta \alpha}{2r}$$

by substitution for ρ from equation (2). Hence the total moment due to both faces tending to rotate the element

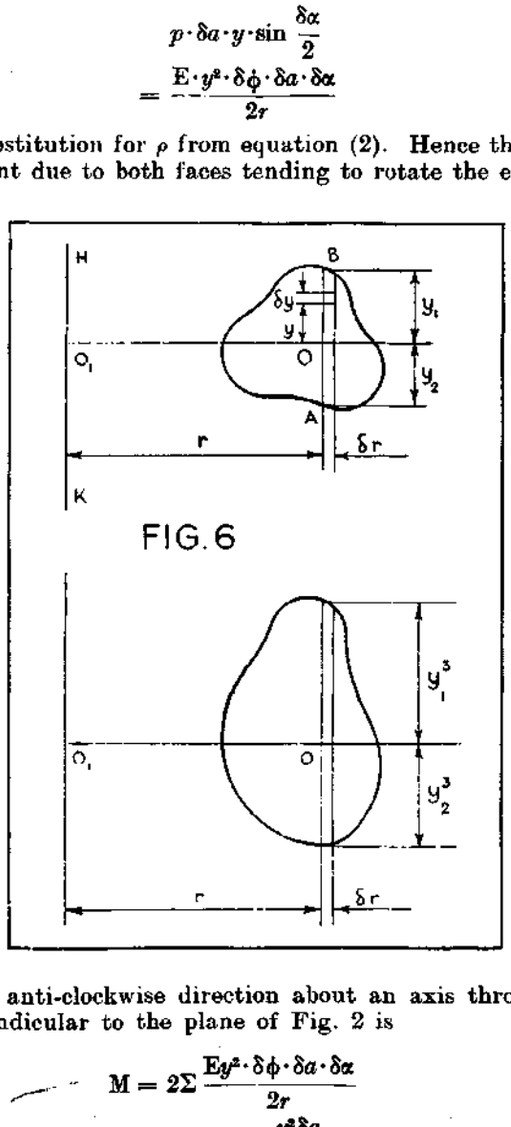


FIG. 6

in an anti-clockwise direction about an axis through O perpendicular to the plane of Fig. 2 is

$$M = 2\Sigma \frac{E y^2 \cdot \delta \phi \cdot \delta a \cdot \delta \alpha}{2r} = E \cdot \delta \phi \cdot \delta \alpha \, \Sigma \frac{y^2 \delta a}{r} \quad \ldots\ldots \quad (10)$$

This couple must be balanced by the moment of the external forces on the element. Hence, if W is the total load carried by the ring, the load on the element will be $\frac{W \cdot \delta \alpha}{2\pi}$ and putting $R_2 - R_1 = b$, the moment of the external forces is

$$M = \frac{W \cdot \delta \alpha}{2\pi} \cdot b \quad \ldots\ldots\ldots \quad (11)$$

Equating (10) and (11) we get

$$\frac{Wb}{2\pi} = E \cdot \delta \phi \, \Sigma \frac{y^2 \delta a}{r} \quad \ldots\ldots \quad (12)$$

From equation (2) the stress for a given twist $\delta \phi$ is proportional to y/r and is therefore a maximum at the point where a line drawn from O_1 touches the boundary of the section such as at A, Fig. 2. Let β_m be the inclination of this line to O_1O and ρ_m the maximum stress. Then,

$$p_m = E \tan \beta_m \cdot \delta \phi$$

$$\therefore \quad \delta \phi = \frac{p_m}{E \tan \beta_m} \quad \ldots\ldots\ldots \quad (13)$$

Inserting this value of $\delta \phi$ in (12) we get the equation

$$\frac{Wb}{2\pi} = \frac{p_m}{\tan \beta_m} \Sigma \frac{y^2 \cdot \delta a}{r}$$

$$\therefore \quad p_m = \frac{W \cdot b \cdot \tan \beta_m}{2\pi \, \Sigma \frac{y^2 \cdot \delta a}{r}} \quad \ldots\ldots\ldots \quad (14)$$

Before ρ_m can be evaluated we must know the value of $\Sigma \frac{y^2 \cdot \delta a}{r}$ for the section. This may be obtained as follows:—Divide the section into a convenient number of strips of width δr parallel to HK as in Fig. 6.

For a strip such as AB, r is constant

$$\therefore \quad \Sigma_A^B \frac{y^2 \delta a}{r} = \int_A^B \frac{y^2 \cdot \delta y \cdot \delta r}{r} = \frac{\frac{1}{3}(y^3_1 + y^3_2)\delta r}{r}$$

Hence construct the y^3 curve as indicated in the lower portion of Fig. 6. As before, divide the area into a number of strips parallel to the axis and divide the area of each strip by the corresponding radius r. The sum of the results so obtained and divided by 3 will be $\Sigma \frac{y^2 \delta a}{r}$. Inserting this value in equation (14) we obtain the maximum stress p_m.

In a section having a plane of symmetry perpendicular to HK, O_1O will contain the centroid of the section, and if we neglect the variation of r across the section by assuming it to have a constant value R which may be taken as the centre of area, the stress at any point by equation (2) becomes

$$p = \frac{E}{R} y \delta \phi \quad \ldots\ldots\ldots \quad (15)$$

according to which the maximum stress occurs in the filaments most remote from O_1O. Denoting the maximum value of y by y_c and the maximum stress by p_c we get,

$$p_c = \frac{E}{R} \cdot y_c \cdot \delta \phi$$

$$\therefore \quad \delta \phi = \frac{R}{E} \frac{p_c}{y_c} \quad \ldots\ldots\ldots \quad (16)$$

Equation (12) may then be written

$$\frac{Wb}{2\pi} = \frac{R p_c}{y_c} \Sigma \frac{y^2 \cdot \delta a}{R} = \frac{p_c}{y_c} \Sigma y^2 \delta a = \frac{p_c}{y_c} \cdot I = p_c Z \quad \ldots\ldots\ldots \quad (17)$$

where I and Z denote the moment of inertia and modulus of the section respectively about an axis

passing through the centre of area and normal to HK. Hence,

$$p_c = \frac{Wb}{2\pi Z} \quad \ldots\ldots\ldots\ldots \quad (18)$$

We have assumed in deriving the stress equation (2) or (14) that the section rotates through an angle $\delta\phi$. The deflection of the load is therefore $b\cdot\delta\phi$ or $= \triangle = b\cdot\delta\phi$ where $\triangle$ is the deflection.

Taking the value of $\delta\phi$ given by (13) we get,

$$\Delta = \frac{b\cdot p_m}{E\tan\beta_m}$$

and substituting for p_m from (14) we obtain

$$\Delta = \frac{Wb^2}{2\pi E\,\Sigma\frac{y^2\cdot\delta a}{r}} \quad \ldots\ldots\ldots \quad (19)$$

If we adopt the approximate expression for $\delta\phi$ given by (16) the corresponding deflection is

$$\Delta_c = b\cdot\delta\phi = \frac{bRp_c}{Ey_c}$$

which, using the corresponding equation (17) becomes

$$\Delta_c = \frac{Wb^2R}{2\pi EI} \quad \ldots\ldots\ldots\ldots \quad (20)$$

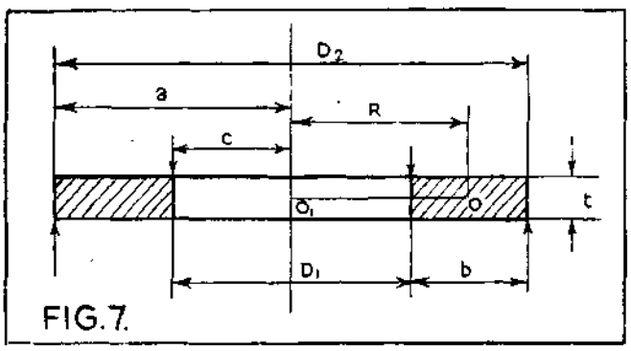


FIG. 7.

As an example of the foregoing let us calculate the maximum stress and deflection of a ring having a rectangular cross-section and dimensions as in Fig. 7.

Since the section is symmetrical, O_1O will pass through the centre of area hence,

$$\Sigma\frac{y^2\delta a}{r} = \int_{R-\frac{b}{2}}^{R+\frac{b}{2}} \frac{\frac{1}{3}\left(\frac{t^3}{8}+\frac{t^3}{8}\right)}{r}dr$$

$$= \frac{1}{12}t^3\log_e\frac{R+\frac{b}{2}}{R-\frac{b}{2}}$$

also $\quad \tan\beta m = \dfrac{t}{2R-b}$

inserting these expressions in equation (14) we get

$$p_m = \frac{Wb\cdot\frac{t}{2R-b}}{2\pi\cdot\frac{1}{12}t^3\log_e\frac{R+\frac{b}{2}}{R-\frac{b}{2}}}$$

$$= \frac{6Wb}{\pi t^2(2R-b)\log\frac{2R+b}{2R-b}}$$

$$= \frac{3W(D_2-D_1)}{\pi t^2 D_1\log_e\frac{D_2}{D_1}} \quad \ldots\ldots \quad (21)$$

Using the above value of $\Sigma\frac{y^2}{r}\cdot\delta r$ in equation (19) we get the deflection

$$\Delta = \frac{Wb^2}{2\pi E\cdot\frac{1}{12}t^3\log_e\frac{R+\frac{b}{2}}{R-\frac{b}{2}}}$$

$$= \frac{6Wb^2}{\pi Et^3\log_e\frac{D_2}{D_1}} \quad \ldots\ldots\ldots \quad (22)$$

If we neglect the variation of r in the section the corresponding approximate expressions for maximum stress and deflection are easily obtained from equations (18) and (20) which in the special case under consideration become

$$p_c = \frac{3W}{\pi t^2} \quad \ldots\ldots\ldots\ldots \quad (23)$$

$$\Delta_c = \frac{6WbR}{\pi Et^3} \quad \ldots\ldots\ldots\ldots \quad (24)$$

For the example of Fig. 7 it is possible to compare the results with the stress and deflection calculated by the usual flat plate formulæ. Although this may be regarded as an extreme case the agreement is fairly good for a circular plate in which the outer diameter is twice the inner diameter, but the agreement improves as the ring narrows or the section thickens.

The circumferential stress at radius r resulting from the flat plate theory is

$$p^\theta = \frac{-3W}{2\pi mt^2}\left[\left\{(m+1)\log r - \tfrac{1}{2}(m-1)\right\}\right.$$
$$+\left\{\frac{c^2\log c - a^2\log a}{a^2-c^2} - \frac{(m-1)}{2(m+1)}\right\}(m+1)$$
$$\left.-\frac{(m+1)}{r^2}\,\frac{a^2c^2}{(a^2-c^2)}\log\frac{a}{c}\right] \quad \ldots \quad (25)$$

where M is the reciprocal of Poisson's ratio and may be taken as $\frac{10}{3}$, c and a are the inner and outer radii of the ring.

The stress is a maximum when $r = c$, and for a ring in which $C = 1$, $a = 2$.

$$p_\theta = 1\cdot48\,\frac{W}{t^2}$$

The corresponding expression for the deflection is given by

$$\Delta = \frac{6W(m^2-1)}{\pi Et^3 m^2}\left[\frac{1}{4}\left\{-\frac{3m+1}{2(m+1)} + \frac{a^2}{a^2-C^2}\log\frac{c}{a} + \log\frac{r}{c}\right\}r^2\right.$$
$$+\tfrac{1}{2}\frac{m+1}{m-1}\cdot\frac{a^2c^2}{a^2-c^2}\cdot\log\frac{a}{c}\cdot\log\frac{a}{r}$$
$$\left.+\tfrac{1}{4}\frac{a^2c^2}{a^2-c^2}\log\frac{a}{c} + \frac{(3m+1)}{8(m+1)}a^2\right]$$

The maximum deflection is at $r = c$, hence putting $r = 1$, $a = 2$ we get the deflection

$$\Delta = 2\cdot68\,\frac{W}{Et^3}$$

Expressions (21) and (22) give for the maximum stress and deflection of the same plate

$$p_m = 1\cdot375\,\frac{W}{t^2}$$

$$\Delta = 2\cdot75\,\frac{W}{Et^3}$$

The corresponding values obtained from the more approximate formulæ (23) and (24) are

$$p_c = 0{\cdot}955\,\frac{W}{t^2}$$

$$\Delta_c = 2{\cdot}86\,\frac{W}{Et^3}$$

These results show that even in the case of a thin flat plate the error involved in using equations (21) and (22) is not great.

Fortunately, the error is less with a more solid section; for example, if referring to Fig. 7 we take $a = 2$ and $c = 1.5$, we get from the flat plate theory

$$p_\theta = 1{\cdot}14\,\frac{W}{t^2}$$

and from equation (21)

$$p_m = 1{\cdot}10\,\frac{W}{t^2}$$

This example again illustrates that, as was to be expected from general considerations, the smaller the radial dimensions of the wing section in relation to the depth the more nearly is uniform rotation approached, and hence the method here developed more appropriate.

With due regard to this condition the stress at any point of any section may be calculated either analytically or by the graphical methods outlined.

ENGINE MOUNTING STRESSES

By R. Rodger.

(*Concluded from page* 31)

ERRATUM.

In the penultimate line of last month's instalment an error occurred, which readers are asked to correct in their copies. The words in italics read "*nose down.*" This should have been "*nose up.*"

11. Load Factors

The forces obtained from the various formulæ quoted above are unfactored loads. In estimating the strength of an engine mounting structure operations are rendered easier by factoring each individual force, then compounding and working to an overall factor of unity.

Fig. 4 gives in a directly useful form a complete synopsis of the data so far discussed.

FIG. 4
CASES, FORCES AND FACTORS

Case	Manœuvre	Stressing Condition: Engine	Stressing Condition: Aircraft	Force	Formula	Factors: Force	Factors: Overall
I	Turning in flight	On	Stall ..	Gravity Thrust Torque Gyro ..	Dead loads (1) (2) (4)	N 2 2 2	1
II	N.F. and landing	Off	Stall ..	Gravity	Dead loads	N	1
III	Static condition	On	At rest tail down	Gravity Thrust Torque	Dead loads 5 lb./h.p. (3)	N 2 2	1
IV	Inverted flight ..	Off	Inverted stall	Gravity	Dead loads	N	1
V	Side load ..	Off	Vertical bank	Gravity	Dead loads	1	1

NOTE.—The dead loads are those stated in paragraph 5. N = load factor on wings with C.P.F. If N<6, then the value 6 should be assumed to ensure rigidity.

12. Loads on A Beam Mounting

Fig. 5 gives the line diagram for a typical beam mounting. Although the engine shown is a water-cooled job only the weight dry has been considered, the various secondary loads to which attention has been drawn in paragraph 5 above having been omitted. The application of these loads is usually local, the estimation of their effect on particular members of the frame following conventional lines and, therefore, presenting no difficulty. Hence, this paper should suffer little by their omission whilst, on the other hand, the ensuing remarks should be considerably clarified thereby.

In all cases it is assumed that the loads are factored, *i.e.*, the unit load has been multiplied by the individual factors quoted in Fig. 4, column 7.

It will simplify matters to first combine the engine and airscrew gravity loads by taking moments about the rear engine feet in side elevation. Thus,

$$Z = (W_E Z_1 + W_A Z_2)/(W_E + W_A)$$

where

Z = distance of combined gravity load c.g. ahead of rear engine feet in side elevation.

The allocation of the loads on a beam mounting follows simple mechanical principles which scarcely warrant discussion here. A complete solution is offered in a handy form in Fig. 6, from which diagram the direction and derivation of any particular load can be read off directly.

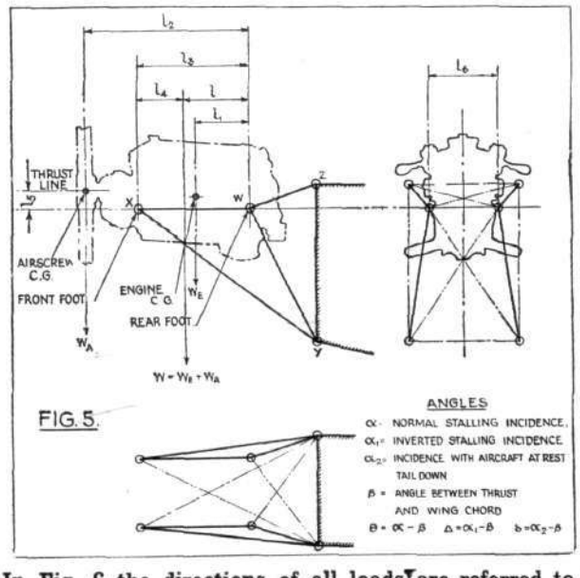


FIG. 5.

FIG. 6 — LOADS ON BEAM MOUNTING

CASE	FORCE	PORT TRUSS: LOADS NORMAL TO BEARER, FRONT FOOT	PORT TRUSS: LOADS NORMAL TO BEARER, REAR FOOT	PORT TRUSS: AXIAL LOADS IN BEARER	STBD. TRUSS: LOADS NORMAL TO BEARER, FRONT FOOT	STBD. TRUSS: LOADS NORMAL TO BEARER, REAR FOOT	STBD. TRUSS: AXIAL LOADS IN BEARER
I PORT TURN	GRAVITY	↓ $l W\cos\theta/2l_3$	↑ $l_4 W\cos\theta/2l_3$	→ $W\sin\theta/2$	↓ $l W\cos\theta/2l_3$	↑ $l_4 W\cos\theta/2l_3$	→ $W\sin\theta/2$
	THRUST	↓ $T_D l_5/2l_3$	↑ $T_D l_5/2l_3$	← $T_D/2$	↓ $T_D l_5/2l_3$	↑ $T_D l_5/2l_3$	← $T_D/2$
	TORQUE R.H.T.	↓ Q_e/l_6			↑ Q_e/l_6		
	TORQUE L.H.T.	↑			↓		
	GYRO R.H.T.	↑ $C_P/2l_3$	↓ $C_P/2l_3$	← C_Y/l_6	↓ $C_P/2l_3$	↑ $C_P/2l_3$	→ C_Y/l_6
	GYRO L.H.T.	↓	↑	→	↑	↓	←
I STBD TURN	GRAVITY, THRUST, TORQUE R.H.T., TORQUE L.H.T., GYRO R.H.T., GYRO L.H.T.	AS ABOVE	AS ABOVE	AS ABOVE	AS ABOVE	AS ABOVE	AS ABOVE
II	GRAVITY	↓ AS ABOVE	↓ AS ABOVE	→ AS ABOVE	↓ AS ABOVE	↓ AS ABOVE	→ AS ABOVE
III	GRAVITY	↓ $l W\cos\delta/2l_3$	↑ $l_4 W\cos\delta/2l_3$	→ $W\sin\delta/2$	↓ $l W\cos\delta/2l_3$	↑ $l_4 W\cos\delta/2l_3$	→ $W\sin\delta/2$
	THRUST	↓ $T_S l_5/2l_3$	↑ $T_S l_5/2l_3$	← $T_S/2$	↓ $T_S l_5/2l_3$	↑ $T_S l_5/2l_3$	← $T_S/2$
	TORQUE R.H.T.	↑ Q_S/l_6			↓ Q_S/l_6		
	TORQUE L.H.T.	↓			↑		
IV	GRAVITY	↑ $l W\cos\Delta/2l_3$	↓ $l_4 W\cos\Delta/2l_3$	→ $W\sin\Delta/2$	↑ $l W\cos\Delta/2l_3$	↑ $l_4 W\cos\Delta/2l_3$	→ $W\sin\Delta/2$
V	GRAVITY	* Wl/l_3	* Wl_4/l_3		† Wl/l_3	† Wl_4/l_3	

In Fig. 6 the directions of all loads are referred to the side elevation of Fig. 5. * represents a load normal to the plane of the paper, and acting towards the reader, while † indicates acting away from the reader.

A few remarks concerning torque appear necessary. In the case of engines provided with feet and installed in the aircraft by the bolting of such feet to fore-and-aft bearers, it is a feature of modern design practice to localise the torque. This is generally accomplished by making the front pair of feet a rigid attachment and the rear pair a flexible attachment, within reasonable limits, of course.

Some of the later type Rolls-Royce engines, for example the F and R series, have engine feet of the plain webbed type bolted direct to facings provided on the crankcase, localisation of torque being attained by introducing pads of hard fibre or ferodo between the front feet and the bearers and pads of rubber between the rear feet and the bearers.

the construction of the stress diagrams ABCDEF follows the ordinary laws of statics.

The determination of the *sign* of the loads in the members from the stress diagrams, *i.e.*, whether tension or compression, appears to present some difficulty in all but the simplest cases to practical engineers whose daily routine does not, in the main, consist of stress work.

It is not necessary to endeavour to assess the signs of the internal forces by inspection of the load diagram and visualisation of the deflections tending to occur in the frame under load. The signs of the forces in each member of the frame can be ascertained with *certainty* from the stress diagrams by observing a few simple rules.

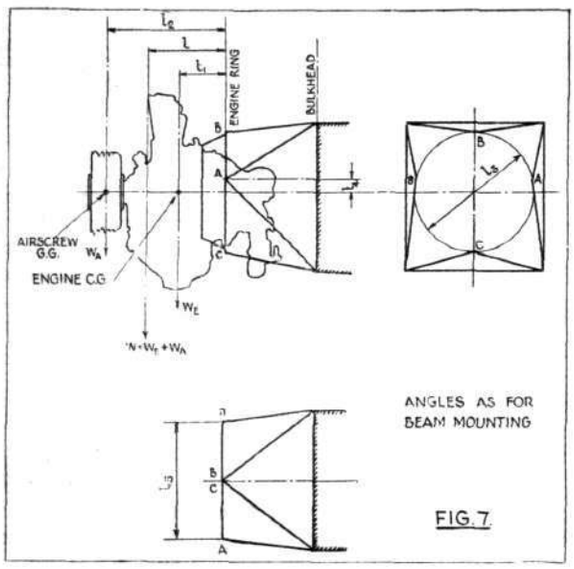


FIG. 7.

FIG. 8.

LOADS ON A SPIDER MOUNTING

CASE	FORCE	NODE A		NODE B		NODE B	NODE C
I PORT TURN	GRAVITY	↓ $W\cos\theta/2$	→ $W\sin\theta/2$	↓ $W\cos\theta/2$	→ $W\sin\theta/2$	← Wl/l_3	→ Wl/l_3
	THRUST		← $T_0/2$		← $T_0/2$	→ $T_0 l_4/l_3$	← $T_0 l_4/l_3$
	TORQUE R.H.T.	↓ Q_0/l_3		↑ Q_0/l_3			
	TORQUE L.H.T.	↑		↓			
	GYRO R.H.T.		← C_Y/l_5		← C_Y/l_5	← C_P/l_3	← C_P/l_3
	GYRO L.H.T.		→		→	→	→
I STBD. TURN	GRAVITY	AS ABOVE	AS ABOVE	AS ABOVE	AS ABOVE	AS ABOVE	AS ABOVE
	THRUST						
	TORQUE R.H.T.						
	TORQUE L.H.T.						
	GYRO R.H.T.		→		→	→	→
	GYRO L.H.T.		←		←	←	←
II	GRAVITY	↓ AS ABOVE	→ AS ABOVE	↓ AS ABOVE	→ AS ABOVE	← AS ABOVE	→ AS ABOVE
III	GRAVITY	↓ $W\cos\delta/2$	→ $W\sin\delta/2$	↓ $W\cos\delta/2$	→ $W\sin\delta/2$	← Wl/l_3	→ Wl/l_3
	THRUST		← $T_S/2$		← $T_S/2$	→ $T_S l_4/l_3$	← $T_S l_4/l_3$
	TORQUE R.H.T.	↓ Q_S/l_3		↑ Q_S/l_3			
	TORQUE L.H.T.	↑		↓			
IV	GRAVITY	↑ $W\cos\Delta/2$	→ $W\sin\Delta/2$	↑ $W\cos\Delta/2$	→ $W\sin\Delta/2$	→ Wl/l_3	← Wl/l_3
V	GRAVITY		← Wl/l_5		→ $W\sin\Delta/2$	* $W(l_5+2l_4)/2l_5$	* $W(l_5-2l_4)2l_5$

In Fig. 8 the directions of all loads are referred to the side elevation of Fig. 7. * as for beam mounting. Case V is for starboard bank. For port bank reverse direction of loads.

Invariably the torque is transferred to the engine mounting structure at a point as near as possible to the airscrew, thus ensuring that the minimum load is transmitted through the engine crankcase. This condition has been assumed in the compilation of Fig. 6 wherein the torque is localised at the front feet.

In the side load case the gravity forces are proportioned between the front and rear feet on one side of the structure only, and are considered to be resisted by the wire bracing triangulation of panels XY and WZ, Fig. 5. Owing to the fact that the gravity forces overhang the bearers in a vertical bank, normal loads are induced at all engine feet, but are of such a small order as to be negligible and amply covered by other cases.

13. Loads on a Spider Mounting

Fig. 7 gives the line diagram for a typical spider mounting. Combine the gravity forces as in the case of the beam mounting.

The allocation of the loads is tabulated in handy form in Fig. 8.

14. Stress Diagrams

Typical stress diagrams for a beam mounting and a spider mounting are shown in Figs. 9 and 10 respectively, only one case being illustrated as the remaining cases merely involve similar principles. These diagrams have been extracted from stress analysis for actual mountings, and the numerical values of the internal and external loads have been quoted as emphasising the illustration.

Taking the beam mounting, Fig. 9, first, several points of interest arise. Bow's notation is used and

Considering Fig. 9, the small diagrams immediately below the port truss stress diagram show the concentration of the external and internal forces at the front

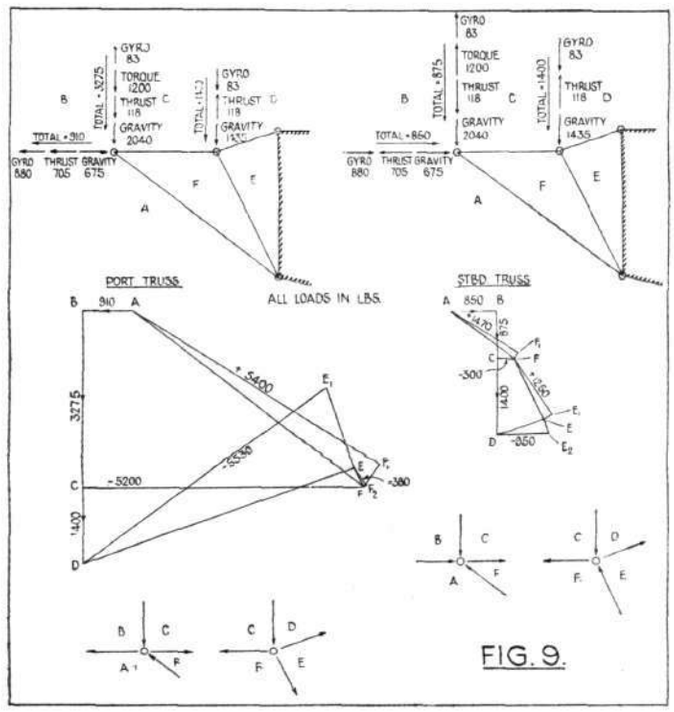


FIG. 9.

Stress diagrams for beam mounting. Case I.—Port turn—R.H.T.

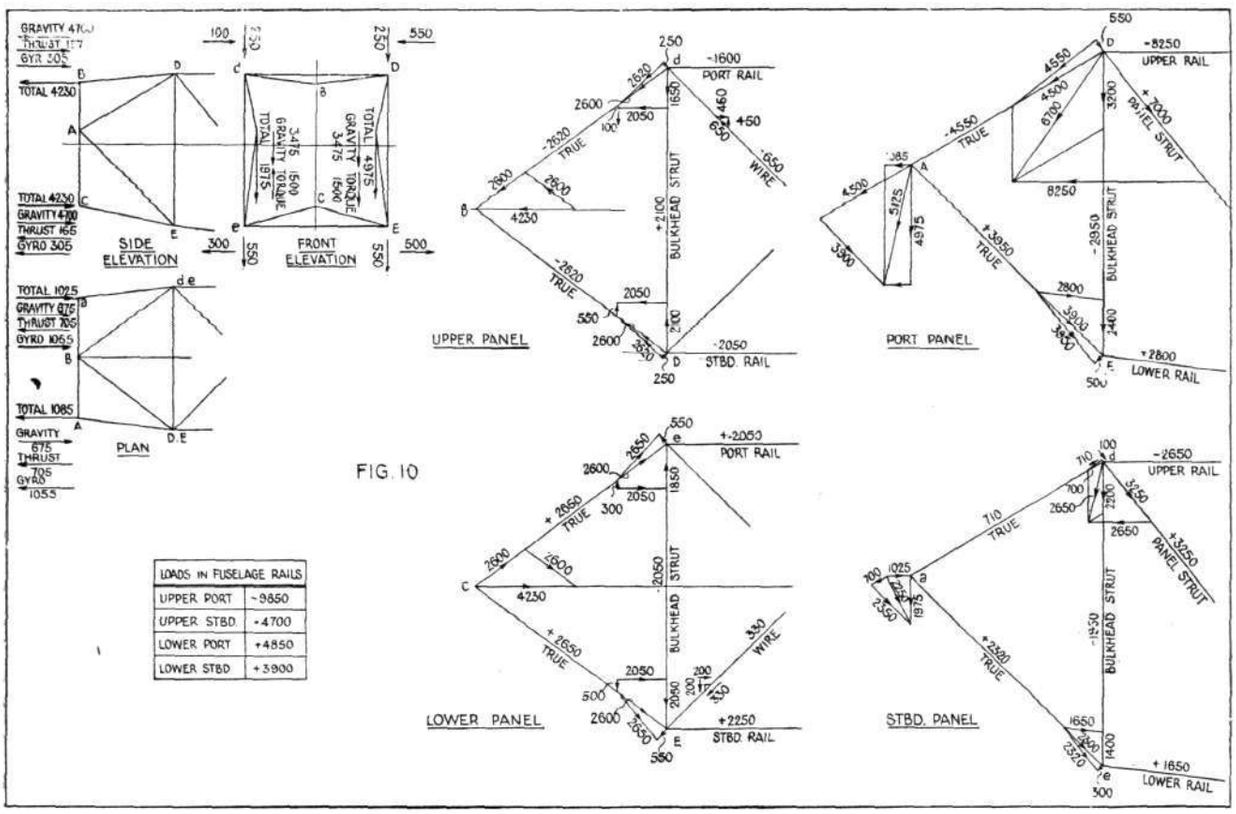


FIG. 10

Stress diagrams for spider mounting. Case I.—Port turn—R.H.T.

and rear engine feet. Read all notation in a clockwise direction, *i.e.*, in the literal sequence CDEF for the rear foot concentration.

Now, the direction of the stress action with reference to the joint under consideration is given by tracing on the stress diagram in the correct literal sequence the direction of the line corresponding to the frame member being considered. This rule is very important and its disregard or incomplete comprehension may lead to incorrect results.

A better understanding of the rule will, perhaps, be obtained by considering its application to the port front foot in Fig. 9, thus:—For member CF, the stress will act in the direction of line CF in the stress diagram, from C towards F, *i.e.*, *away* from the joint. For member FA, the stress will act in the direction of line FA in the stress diagram, from F towards A, *i.e.*, *towards* the joint. To determine the sign of the stress. If its direction is *towards* the joint the stress in the member is *compressive*, and *vice versa*.

Finally, the allowance must be made for the fact that certain members are not in the plane of the paper. Thus, the bearer CF is in the plane of the paper and the load read from the stress diagram is consequently a true load. In the case of members DE, EF and FA, however, which are all inclined to the plane of the paper, the loads given by the stress diagram are apparent only, and the true load must be laid off against each apparent load as shown by DE_1, EF_2 and F_1A in the port stress diagram.

The diagrams for the spider mounting shown in Fig. 10 comprise the successive application of the simple triangle of forces. The sequence may, however, be a little confusing and the steps involved are enumerated below, thus:—

(i) Combine into resultants the external loads at nodes A, *a*, B and C.

(ii) Resolve these resultants into components in the planes of the legs of the spider.

(iii) Allow for obliquity of the legs of the spider, obtaining the true loads in the legs and the induced loads in the plane of the bulkhead panel.

(iv) Transfer all components of the true loads in the legs, as applied at nodes D, *d*, E and *e*, into the front fuselage structure.

15. Loads in a Spin

Although this case is not laid down in A.P. 970 for stressing purposes it is often as well to investigate for this condition, particularly in the instance of ultra-modern high-powered high-speed fighters and day bombers. The whole question has been most ably discussed by Mr. D. Williams, B.Sc., A.M.I.Mech.E., in "The Aircraft Engineer" dated August 28, 1931, under the heading "Forces on the Engine Mounting of a Spinning Aircraft," to which article present readers are referred.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any Bookseller.

THE FLOW OF A COMPRESSIBLE FLUID IN THE NEIGHBOURHOOD OF THE THROAT OF A CONSTRICTION IN A CIRCULAR WIND CHANNEL. By S. G. Hooker, D.I.C., Armourers' and Brasiers' Research Fellow. Presented by Professor L. Bairstow. R. & M. No. 1429. (9 pages and 7 diagrams.) May, 1931. Price 9d. net.

The symmetrical flow of a compressible fluid through a tube is investigated. In Case I there appears to be a limit to the velocity at the centre of the constriction in order that such a type of flow can exist and this limit corresponds to the attainment of a maximum velocity in the field of 1·024*a*. Whether this excess over the velocity of sound is an actual excess or due to numerical limitations in the method of solution has not been determined.

Other results have been compared with experimental values obtained by Sir Thomas Stanton in R. & M. 1388.*

Part II discusses the assymmetrical flow and it is found, as Professor Taylor† pointed out, that this type of flow is unique. The critical values obtained are very close to those observed experimentally.

* R. & M. 1388. The Variation of Velocity in the neighbourhood of the throat of a Constriction in a Wind Channel.—Stanton.

† R. & M. 1381. The flow of air at high speeds past curved surfaces.—Taylor.

AGE-HARDENING OF ALUMINIUM ALLOYS. By Marie L. V. Gayler, D.Sc., and G. D. Preston, B.A. R. & M. No. 1431. (19 pages and 12 figures.) May, 1931. Price 1s. 3d. net.

(1) An investigation into the age-hardening of a series of alloys made with high-purity aluminium containing 4 per cent. copper, to which iron, silicon and magnesium have been added either independently or together, has confirmed the results of previous investigators and new data have also been obtained.

(2) X-ray and microscopic examination have failed, however, to give an explanation of the phenomena observed during age-hardening at room temperature; any changes in the aluminium lattice which may accompany the hardness changes which take place in these alloys cannot be detected by the existing methods of X-ray investigation.

(3) The age-hardening at 200 deg. C. of a duralumin made with very pure aluminium and containing magnesium and copper is accompanied by the precipitation of $CuAl_2$, but the age-hardening of a similar duralumin made with commercial aluminium results in the precipitation of Mg_2Si as well.

DIMENSIONAL STABILITY OF HEAT-TREATED ALUMINIUM ALLOYS. By J. D. Grogan, B.A., and D. Clayton, B.Sc. R. & M. No. 1435. (18 pages and 18 figures.) December 3, 1931. Price 1s. net.

This investigation was carried out to examine a report that serious secular changes occur in light alloys during storage. Subsequently attention was directed to the dimensional changes which occur when heat-treated material is machined.

The following conclusions have been drawn from the investigations:—

(1) No secular changes have been detected in the heat-treated aluminium alloys examined, after the normal age-hardening process is complete.

(2) Considerable dimensional changes occur when material quenched in cold water is machined. Of the alloys examined these changes were greatest in "Y" alloy, less in duralumin and "258" alloy, and still less in copper-silicon alloy.

(3) The central length of a heat-treated cylinder contracts less than the peripheral length when concentric rings are machined from the middle portion of the length of the test-piece; consequently the ends become convex.

(4) When a narrow groove is cut, and subsequently widened, in the middle portion of the test-piece, complicated dimensional changes occur. The first cut produces a large change both in the central and in the peripheral length. Subsequent widening of the cut produces in the central length small changes which reverse in direction, and in the peripheral length uniform changes smaller than the first.

(5) In "Y" alloy and duralumin, the only alloys examined in this manner, quenching in cold oil reduces the dimensional changes which occur on machining as compared with cold water; quenching in boiling water reduces them to relatively small proportions.

(6) Tempering subsequent to quenching in cold water reduces somewhat these dimensional changes in "258" alloy, but increases them to a very small extent in the copper-silicon alloy.

(7) These dimensional changes do not appear in annealed material.

(8) The Brinell hardness of these alloys after quenching in cold water in the form of cylinders 5 in. long and 3 in. diameter attains a value at least equal to that attained by much smaller masses.

(9) Cylinders of "Y" alloy and duralumin, 5 in. long and 3 in. diameter, are satisfactorily hardened by quenching in boiling water.

SOME PRELIMINARY TESTS ON THE EFFECTS OF SIDE-SLIP ON THE ROLLING AND YAWING MOMENTS DUE TO ROLL OF A BRISTOL BIPLANE. By F. B. Bradfield, Math. and Nat. Sci. Triposes, and A. S. Hartshorn, B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1439. (4 pages and 10 diagrams.) June, 1926. Price 6d. net.

The object of the experiments described in this report was to determin whether the effects of roll and sideslip, such as are associated with the spinning of an aeroplane, may be measured independently and their joint effect deduced by adding the component parts.

The results show that the effect of sideslip and roll are not additive after the stall.

It should be noted, however, that in another published paper, R. & M. 1418* a calculation has been made of the combined effect of sideslip and roll using the data of the present report but taking account of the variation in incidence along the span when rolling. The appropriate sideslip term for each position along the span was taken from pressure distribution data on a yawed aerofoil.† The results show that the combined effect may be calculated with considerably better accuracy than by the simple addition of the independent effects, provided the additional data required in the calculation is available.

* R. & M. 1418. Note on the addition of rolling moments due to roll and sideslip.—H. B. Irving.

† R. & M. 1203. Pressure distribution over a yawed aerofoil.—D. H. Williams.

INVESTIGATION OF ATMOSPHERIC TURBULENCE BY AIRCRAFT CARRYING ACCELEROMETERS. By W. G. Jennings, B.Sc., R. P. Alston, B.A., and C. Howarth, M.I.Ae.E., A.F.R.Ae.S. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1441. (6 pages and 10 diagrams.) October, 1931. Price 6d. net.

The object of the experiments described in this report was to investigate the effect of atmospheric turbulence on the normal accelerometer reading recorded when flying in weather in which disturbances, described generally as "bumps," might be expected to occur.

The normal accelerations of four aircraft when flying in types of weather in which large disturbances might reasonably be expected to occur were measured in S.E. England. The maximum and minimum values of the normal accelerometer readings recorded were 2·3 g. and 0·3 g. respectively, and both occurred when flying in the neighbourhood of cumulus clouds. On the hypothesis of a simple sharp-edged gust the corresponding gust velocities are 17 ft./sec. upward and 9 ft./sec. downward. Owing to the absence of suitable weather conditions it was not possible to carry out a useful systematic investigation of the effect of speed and wing loading on the normal acceleration. There is little likelihood of meeting bumps of greater severity over S.E. England, except perhaps in types of weather not experienced this summer, *e.g.*, in abnormally hot or abnormally squally weather.

Further tests carried out in the Northern Highlands produced maximum and minimum accelerometer readings of 3·0 g. and 0 g. respectively. The corresponding vertical gust velocities are 30 ft./sec. upward and 15 ft./sec. downward respectively.

Other experiments are to be made in winds of greater strength as these experiments were limited to 20 m.p.h.

FULL-SCALE DETERMINATION OF THE MOTIONS, AT THE STALL, OF A BRISTOL FIGHTER AEROPLANE FITTED WITH AUTO-CONTROL SLOTS AND INTERCEPTORS. By A. Ormerod, B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1442. (4 pages and 24 diagrams.) October, 1931. Price 4d. net.

Qualitative flight trials have been made of the control at the stall of a Bristol Fighter fitted with slot-and-interceptor control. This control was found to be the most satisfactory type yet tested on a Bristol Fighter. Quantitative measurements were required for comparison with similar records obtained with other types of control.

An analysis of the records shows that the aileron control is powerful and effective and appears to cause yawing moments in the beneficial direction.

FLIGHT TESTS ON AN AEROPLANE WITH A CONTROL COLUMN GIVING WARNING OF DANGEROUS WING LOADS. By H. E. Wimperis, C.B.E., M.A., F.R.Ae.S., M.I.E.E. Communicated by the Director of Scientific Research, Air Ministry R. & M. No. 1446. (6 pages and 4 diagrams.) July, 1931. Price 6d. net.

Since the speed capacity of modern aeroplanes continually rises, whilst the reaction time of the human body remains unchanged, it becomes necessary to consider the manœuvre stresses likely to arise in the future on account of this increasing disproportion. The highest stress that can arise during any manœuvre carried out without loss of height is measured by the ratio of the square of the top horizontal speed to the square of the stalling speed, being indeed given in the usual "accelerometer reading" by this very ratio; hence the load coming on to the wing of an aerobatic machine (constructed to present-day load factors) during such manœuvres will not produce dangerous loads on the wing. It is only when height is lost, so that the speed may rise much above top horizontal speed, that mishandling of the controls by the pilot may lead to structural failure.

In view, therefore, of the increase in speed of modern aircraft it became necessary to consider the possible introduction of a device to give warning to the pilot when the load on the wings grew dangerously high. A special form of control column containing an accelerometer device was made for this purpose and tried in the air.

The device was tested in the laboratory at R.A.E. to determine the speed of conveyance of the signal in relation to the reaction time of the human body and subsequently in the air when fitted to a Siskin aeroplane. It was found that the signal was rapidly given and was easily noticed.

FULL-SCALE LIFT AND DRAG CURVES OF A STANDARD SEAPLANE. By A. S. Crouch, D.I.C., A.C.G.I. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1448. (4 pages and 7 diagrams.) December, 1931. Price 6d. net.

R. & M. No. 1354* describes full-scale lift and drag measurements made on the Blackburn "Iris II" in which a method proposed by Mr. McKinnon Wood for obtaining zero thrust† was adopted. This method has now been used in tests on a standard seaplane with a R.A.F. 15 modified wing section, and the lift and drag curves have been compared with those of the aircraft with airscrew fixed. From the two drag curves thus obtained the drag of the stopped airscrew is deduced.

The drag coefficient of the fixed airscrew is practically constant up to about 10° incidence and equal to 0·004. This is equivalent to a drag of 5·5 lb./sq. ft. of projected blade area at 100 ft./second.

* R. & M. 1354. Full-scale measurement of lift and drag of large Seaplanes —experiments on Blackburn "Iris."—Coombes and Cushing.

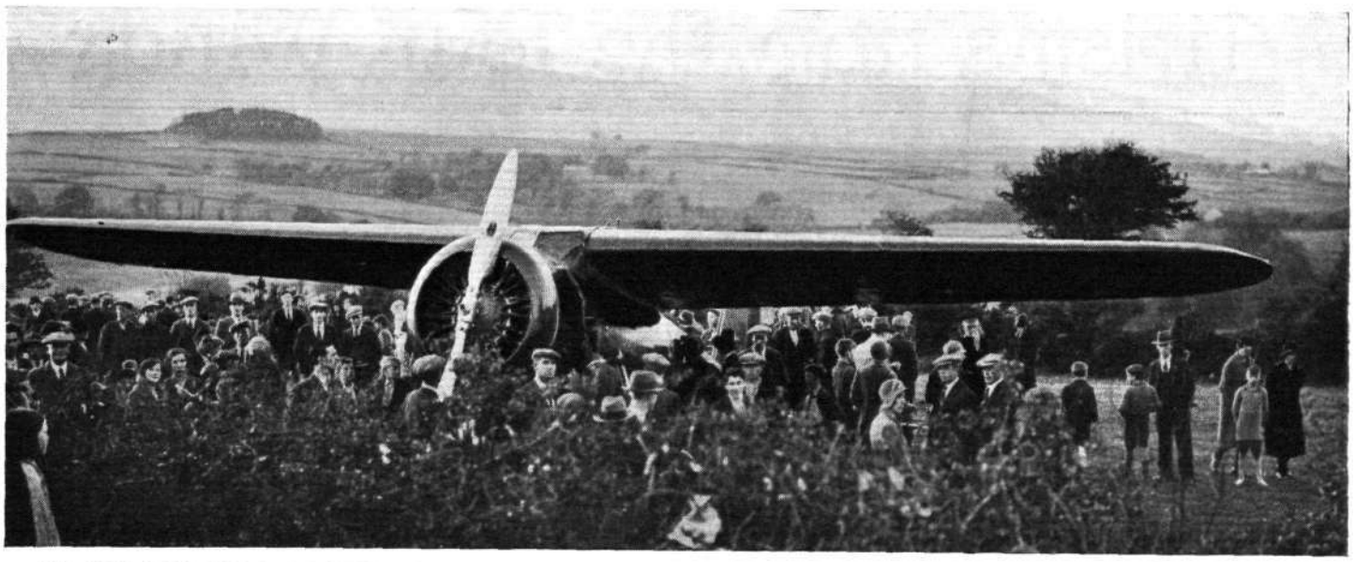
† R. & M. 1447. Thrust integrating tubes. Wind tunnel experiments.—Lock, Johansen and Nixon.

THE INTERFERENCE ON THE CHARACTERISTICS OF AN AEROFOIL IN A WIND TUNNEL OF CIRCULAR SECTION. By H. Glauert, F.R.S. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1453. (12 pages.) December, 1931. Price 9d. net.

Approximate formulæ for the interference on an aerofoil in a tunnel have been in general use for many years, and attemps have been made to develop more accurate formulæ, but the analysis does not take account of the change of lift distribution caused by the tunnel constraint.

A general method of analysis has been developed for an aerofoil in a tunnel of circular section, and has been applied to aerofoils of elliptic and rectangular plan form.

It is demonstrated that the formulæ derived from the assumption of elliptic distribution of lift are sufficiently accurate for all conventional shapes of aerofoil, but that those derived from the assumption of a uniform distribution over-estimate the effect of increasing the span of the aerofoil. If the tunnel correction is required with an accuracy of 10 per cent. only, it is unnecessary to allow for the change of the correction factor with the span of the aerofoil.



"LADY LINDY'S" LOCKHEED: Miss Earhart's Lockheed "Vega" monoplane in the field outside Londonderry, after the Atlantic crossing.

MISS AMELIA EARHART'S ATLANTIC FLIGHT

First Woman to Accomplish Solo Crossing

FOR the first time in the History of Aeronautics the Atlantic has been conquered by a woman pilot, flying solo. This feat has been accomplished by Mrs. G. P. Putnam—or, as she is better known, Miss Amelia Earhart—who in 1928 flew as passenger from Newfoundland to South Wales in the Fokker seaplane *Friendship*, piloted by Wilmer Stultz. Miss Earhart—who has been nicknamed "Lady Lindy" on account of her likeness to Col. Charles Lindbergh, who made the first solo Atlantic flight exactly five years previous to her present feat—has also accomplished the crossing in the fastest time so far achieved.

Miss Earhart, flying a Lockheed "Vega" high-wing monoplane (420-h.p. Pratt & Whitney "Wasp"), left New Jersey, accompanied by Mr. Balchen and Mr. Gorski, on May 19 and flew to St. John, New Brunswick, and the next day she went on to Harbour Grace, Newfoundland. Here the machine was immediately refuelled, and two hours later—at 7.30 p.m. (local time, or 10.30 p.m. B.S.T.)—she set out alone across the Atlantic.

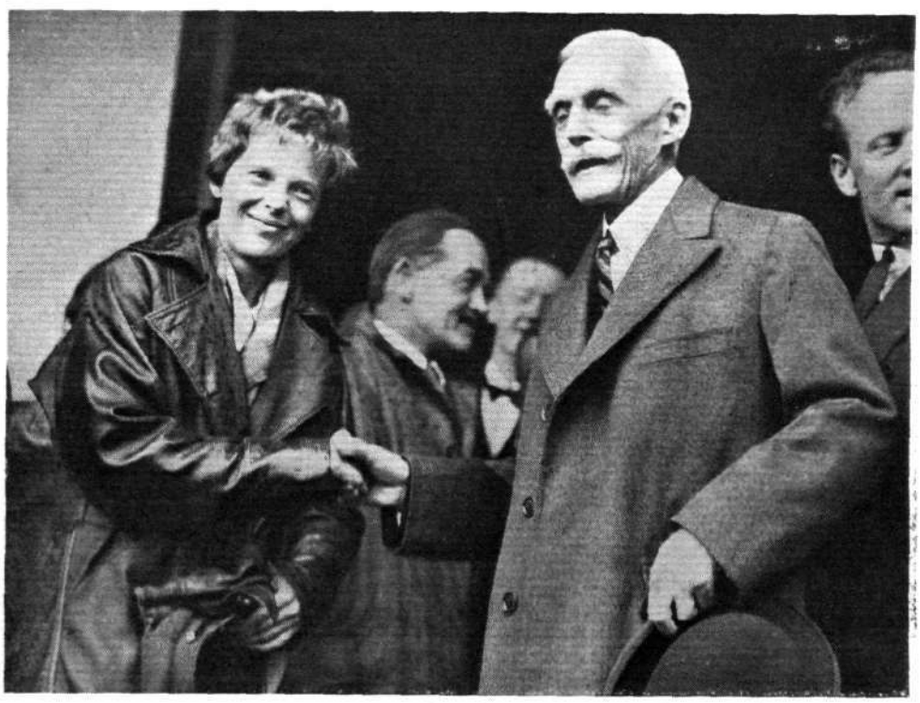
At first weather conditions were ideal, but four hours out her troubles began. First, the exhaust manifold began to burn through, and this trouble got worse as time went by—a portion of the manifold eventually breaking away. Miss Earhart could see the flames in the darkness, especially when, later, trouble number two—a leaky petrol gauge—developed.

She decided, however, not to turn back, and continued on into heavy weather. To make matters worse, she had altimeter trouble, and was unable to tell exactly whether she was 100 or 300 ft. above the water. She climbed to a higher altitude to try and find better weather, but then ice formed on the machine, and she had to come down low again.

At dawn she saw a ship, which greeted her with a blast from its siren, and later saw land ahead. Actually, she made landfall at 11.45 a.m. (or 8.45 a.m. Newfoundland time, by her watch) off Donegal. The flight across the Atlantic, therefore, occupied 13¼ hours, the fastest of all Atlantic crossings.

She was uncertain as to her whereabouts, and turned north to escape the clouds on the hill tops, and eventually picked up a railway, which she followed, hoping to locate "a big city with its airport." Miss Earhart found the "city"—Londonderry—but no airport, so looked around for a suitable field outside. This she found on a farm at Culmore, where she made a safe landing at 1.45 p.m.

Londonderry gave her a warm reception, including a greeting from the Mayor. She spent the night at Mr. Gallagher's farm, and next day she was flown in a N.F.S. Desoutter air taxi to Blackpool, whence she continued in a similar machine to Hanworth. Here she was welcomed by Mr. Mellon, the American Ambassador, and Col. the Master of Sempill. Pratts' spirit and oil was used on this flight.



IN LONDON: Miss Earhart greeted by the American Ambassador, Mr. Mellon, and Col. the Master of Sempill (right), at Hanworth.

Airisms from the Four Winds

Lady Bailey and Miss Salaman "Missing"

LADY BAILEY and Miss Peggy Salaman flew to Ireland on May 22, hoping to greet Miss Earhart after her Atlantic flight, but arrived there just after she had left for Hanworth. They started off in pursuit almost immediately, but up to midnight no further news of them—other than that they passed over Blackpool—came to hand, and at first some anxiety was felt in view of the very bad weather conditions prevailing. However, next day it was announced that they had reached home safely, having landed en route on account of the bad weather.

"Moths" for Egypt

IT will be remembered that five D.H. "Moth" training machines were ordered some time back by the Egyptian Government, and were recently despatched by boat to Egypt. The Egyptian Government, however, wished them to be flown to Egypt by Egyptian pilots, and so they were ordered back to England from Gibraltar, where they had arrived meanwhile, and back they came. Eventually, on May 23, the five "Moths," led by Flt. Lt. Stocks, director of flying training in Egypt, left Hatfield aerodrome in formation for Egypt, with a send off from the Egyptian Minister.

Congress of Trans-Oceanic Flyers

THE opening of the Congress of Oceanic Flyers at Rome on May 22 was marred by a tragedy the day before. The two Hungarian airmen, MM. Endresz and Bittay, who crossed the Atlantic from Newfoundland to Hungary in the *Justice for Hungary* last July, were just about to land on the Littorio aerodrome when the machine side-slipped and crashed, bursting into flames. Both men were burned to death. In delivering his speech of welcome at the opening of Congress, Signor Mussolini expressed deep regret at the tragedy, and everybody rose and stood silent for one minute. Sir Arthur Whitten Brown, replying on behalf of the Congress, also expressed regret, and paid tribute "to all those who have paid with their lives the price of their devotion to the cause of science and progress of aviation."

Bristol "Bulldogs" in Siam

SOME two and a-half years ago Bristol "Bulldog" all-steel single-seater day and night fighter aircraft were supplied to the order of the Siamese Government by the Bristol Aeroplane Co., Ltd. A report just received from Col. Phya Tayarn Bigat, the Director of the Royal Aeronautical Workshops at Bangkok, concerning the "Bulldog" machines states:—"The machines are very easy to fly, quickly respond to the controls both on the ground and in the air, and in flight are most comfortable. The supercharged Jupiter engines as used in these machines are running well and in good order, have given no trouble, are easy to operate and the complete units, engines and planes, may be considered satisfactory."

A Crashing Film

A FILM worth seeing is "The Lost Squadron," now showing at the Tivoli in the Strand. It is, however, disappointing, and gives one the impression that a lot of good material has to some extent been wasted, but at the same time it is interesting as it includes at least one crash which is known to be an authentic one. In his memorable book, Dick Grace gave a description of some of the precautions he took when staging flying crashes for film producers, and he announced that his last crash would be straight into the sea. This present film shows this crash as well as two others. The story itself is thin, as so many American stories are, and it deals with the foibles of a mad German producer who wishes his pilots to crash so that he may get a good picture. Cut out the weak parts, however, and you have quite a fair amount of real aircraft interest, though why the story must be laid in 1919 when no such aircraft as those shown were used, is difficult to understand. At least two films are being made on flying subjects in this country; let us hope that they will not include such elementary mistakes. Why! in one place we see an aircraft diving to its doom, but when it arrives on a house it has conveniently shed its nice modern wings and adopted a pair of very ancient looking ones!

A Looping Record?

AN officer of the Argentine Air Force has accomplished 328 consecutive loops at Cordoba. He also threw in 30 spinning nose dives and 89 Immelman turns!

Autogirations

MR. J. N. YOUNG, who is attempting a flight from England to the Cape in an Autogiro, landed on May 19 at Catania, Sicily, from Marseilles, and later made a successful crossing of the Mediterranean to Tunis.

On May 19 Mr. R. A. C. Brie flew an open 2-seater C.19 type Autogiro from Hanworth to Renfrew, Glasgow, in 5 hr. 20 min., including a stop en route at Newcastle. The actual flying time was 4 hr. 30 min.

It is reported that an Autogiro will be employed in controlling road traffic to and from Epsom Downs on Derby Day. Two Scotland Yard officers will act as observers, and they will, from a height of about 2,000 ft., have a clear view of all roads leading to the Downs. Should there be an undue pressure of traffic on one road the officers will transmit by wireless instructions for a certain section of the traffic to be diverted.

The Cierva Autogiro Company has been awarded by the Board of the Daniel Guggenheim Medal Fund the gold medal for the year 1931 to 1932 for development of the theory and practice of the Autogiro. This award is the highest obtainable in aeronautics. It was first given to Orville Wright, the second to Ludwig Prandtl, and the third to Frederick William Lanchester. The actual presentation is to take place on December 6 next in New York, and is planned in connection with the annual meeting of the American Society of Mechanical Engineers. It is hoped that Mr. de la Cierva will be able to be present in person.

WITH THE POWERS OF NEMESIS: Capt. A. G. Lamplugh, Underwriter and Principal Surveyor of the British Aviation Insurance Co., Ltd., is here seen at Heston with his company's "Puss Moth." Everyone was glad to see him walking about again after his accident. He looked very fit, although it will be seen that he still has to rely on a "strut" for his "undercarriage." (FLIGHT *Photo.*)

Airport News

CROYDON

CONSIDERABLE excitement was caused over the week-end by the anticipated arrival of Miss Amelia Earhart, the transatlantic heroine. Pressmen were waiting all Saturday and Sunday expecting her to arrive at Croydon, and when she ultimately arrived at Hanworth great was the wailing and gnashing of teeth at the time wasted.

The news of the regrettable death of Maj. I. W. C. Clarke, while returning from Londonderry with photographs of Miss Earhart, was received here at Croydon with dismay. Everyone here knew him so well. A really wonderful pilot—one of the old school—and to think he should meet his death on such a flight. Aviation has received another severe blow with his death, and great is the loss to Personal Flying Services. He was one of the organising brains of the company, and we offer them our deepest sympathy in the loss of a greatly respected man.

On Monday of the week under review some unexpected passengers went out on the 12.30 K.L.M. service, namely, the Emir Feisal and his staff. They were travelling incognito.

A slight mishap befell the first of the new Monospar machines, built by the General Aircraft Company, on Monday, when Flt. Lt. Schofield, on his first take off with full load, had one engine cut out suddenly and had to do some quick thinking. Realising that he would be unable to clear the houses at the top of the ridge (he was taking off with a south south-westerly wind), he decided to put the aircraft down as soon as possible. The wing was damaged, and also the nose of the machine. Flt. Lt. Schofield and his three passengers escaped unhurt.

On Friday Capt. O. P. Jones, with a full load of passengers, took *Heracles* to Glasgow. The flight was an experiment in two-way wireless communication with the London & North Eastern Railway's famous train "The Flying Scotsman." He followed the train for part of the way. The experiment was apparently very successful, but this stunt was carried out in America years and years ago.

Primo Carnera, the giant boxer, is making good use of the airways these days. He is quite a frequent passenger, also Mr. Jeff Dickson, the boxing promoter.

The second Polytechnic Tour to Basle was again full up on Saturday, and I understand that for many weeks ahead machines are fully booked.

The weather was particularly bad on the return trip to Croydon, especially mid-Channel. Capt. Hope, of Air Taxis, Ltd., incoming from Paris, on a "Puss Moth" fitted with radio telephony, made his *début* in flying blind, and being brought to Croydon. It is understood that Capt. Hope is full of praise for the Control Tower staff.

Grass cutting on the aerodrome has been in progress all the week. This work is now done very quickly by ganged mowers, and is a great improvement on the old method of using only one knife. The artificial manure has certainly improved the aerodrome surface.

All the K.L.M. staff have now been regaled in very smart uniforms, including the pilots, and the aerodrome will soon have a nautical air about it. Practically everybody is in uniform here these days, and it certainly adds a very businesslike appearance, making civil aviation look like the real business that it is, and not just a sort of haphazard affair.

A fair amount of joyriding was done over the week-end, but, of course, the weather was not very kind, especially on Sunday afternoon and evening.

The British Air Transport Company have acquired a three-seater Hermes "Spartan," which looks a really smart affair. The traffic figures for the week were:—Passengers, 1,007; freight, 46 tons. P. B.

FROM HESTON

TUESDAY, May 17.—The finest flying day yet experienced this year, and Airwork School of Flying found itself unable to cope with the number of pupils wishing to fly.

The Customs office was kept busy all the day, the first clearance being at 6.30 a.m. and the last at 8.41 p.m. In all, 19 clearances were made.

Banco sent off five machines to Berck, and six arrived from Berck. Among their passengers were Lord Dalkeith, Sir Hugh Seely, Lady Mary Herbert, Brig.-General A. C. Critchley and Capt. Alan Stanley. Personal Flying Services, Ltd., made a similar journey with their "Junkers."

Two private owners returned from St. Inglevert; one from Paris; and one left for Paris.

D-1169 arrived from Germany, *via* Ostend, the pilot being Herr Max Behland, who intends to show England some real stunt flying. His machine is painted red, and he also wears a very smart aviation suit with jack boots—all coloured red (see page 468).

Another most interesting arrival was Mrs. Mansfield Markham, who, in an "Avian," flew solo from Kenya. She gave a very interesting account of her trip, and although she had experienced several forced landings owing to sand getting into the engine—and this in desert country—appeared to treat her exploit as nothing out of the ordinary.

Mr. Brett arrived from Cannes in F-AJZB Special ("Gipsy II Moth").

Mr. Ledlie, of Personal Flying Services, Ltd., arrived from Budapest with one passenger in a "Desoutter." He left Budapest at 8.10 a.m., lunched in Nuremberg, tea in Cologne, and reached Heston at 8.25 p.m.

Wednesday.—There was great activity during the morning with the arrival of aeroplanes attending the Household Brigade Flying Meeting.

The German "Klemm" D-1901 cleared Customs and left for Berlin with Herr Theo Osterkamp as pilot and one passenger.

An Imperial Airways machine, D.H.50, landed at Heston with passengers, the pilot being Maj. Travers, of Imperial Airways staff.

Thursday.—Lord Willoughby de Broke arrived in his "Puss Moth" with one passenger from Frankfurt.

Airwork School of Flying was busy all day.

Friday.—Mr. Ambler arrived from Frankfurt in his "Puss Moth."

Saturday.—Owing to the *Morning Post* Race, the School of Flying had to be closed down until the last competitor had left, but between then and the afternoon, when the rain arrived, the School kept steadily going.

It was interesting to hear from the winner of the third prize in the race (Mr. G. Baillie) that he was very grateful and gained much assistance from the weather reports broadcast from the A.A. Weather Bureau at Heston. His was the only machine in the race fitted with wireless.

Maj. Clarke ("Nobby"), of Personal Flying Services, Ltd., left in the "Desoutter" for Dublin at 8.30 a.m. All who knew him were grieved to hear on Sunday morning of his fatal accident. He was respected and admired by everyone.

Banco took a passenger to Gloucester, starting at 7 p.m. and returning the same evening.

Sunday.—Banco took two passengers to Brighton in their "Puss Moth."

Mr. Nigel Norman, Director of Airwork, Ltd., is organising a party of private owners to attend the Aero Club of Germany Air Pageant at Tempelhof on June 12. It is hoped, therefore, that those intending to take part will let him know in due course.

The National Aviation Day, which was to have been held by Sir Alan Cobham at Heston on May 26, has been postponed until some future date which has not yet been fixed.

The Ugo Antoni Variable Wing

BY the publication, in FLIGHT of May 13, 1932, of the articles on the Schmeidler (German) and Makhonine (French) variable-lift wings, we called attention to the work which is going on abroad in an effort to increase the speed range of aircraft. In commenting on Herr Heinze's description of the Schmeidler wing, we pointed out that an increase in chord and camber seemed a less logical way of attacking the problem than the Makhonine way of varying the span. Of the two, it would appear that the German method is the easier from a mechanical point of view, even if the resulting advantages are smaller, so that the net gain may be as large in the one case as in the other.

The possibilities of the variable-lift wing are, of course, by no means exhausted with these two systems. The Fairey variable-camber gear has been in use for many years in this country, and as the extra weight of the gear is very small, it is well worth using. Against it may be advanced the argument that, with a trailing edge flap, the amount of camber variation is limited, while the sudden break in aerofoil contour is liable to be less efficient than would be a variable-camber wing in which the rib flanges were actually bent, resulting in a smooth curvature.

Such a wing will be produced in this country in the near future. It owes its inception to an Italian engineer, Signor Ugo Antoni, but is to be built by the Gloster Aircraft Co., Ltd., at their works at Hucclecote, Gloucestershire. Signor Antoni has worked on the problem of variable-lift wings for very many years, and it is of interest to record that as long ago as 1907 he took out a patent on a variable-camber wing. For various reasons Signor Antoni has not yet been able to get his latest type of wing made in Italy, although this will probably be done sooner or later. In the meantime he has arranged with the Gloster firm to construct a wing for him, and the first of these wings is to be fitted to a "Breda" monoplane for flying tests.

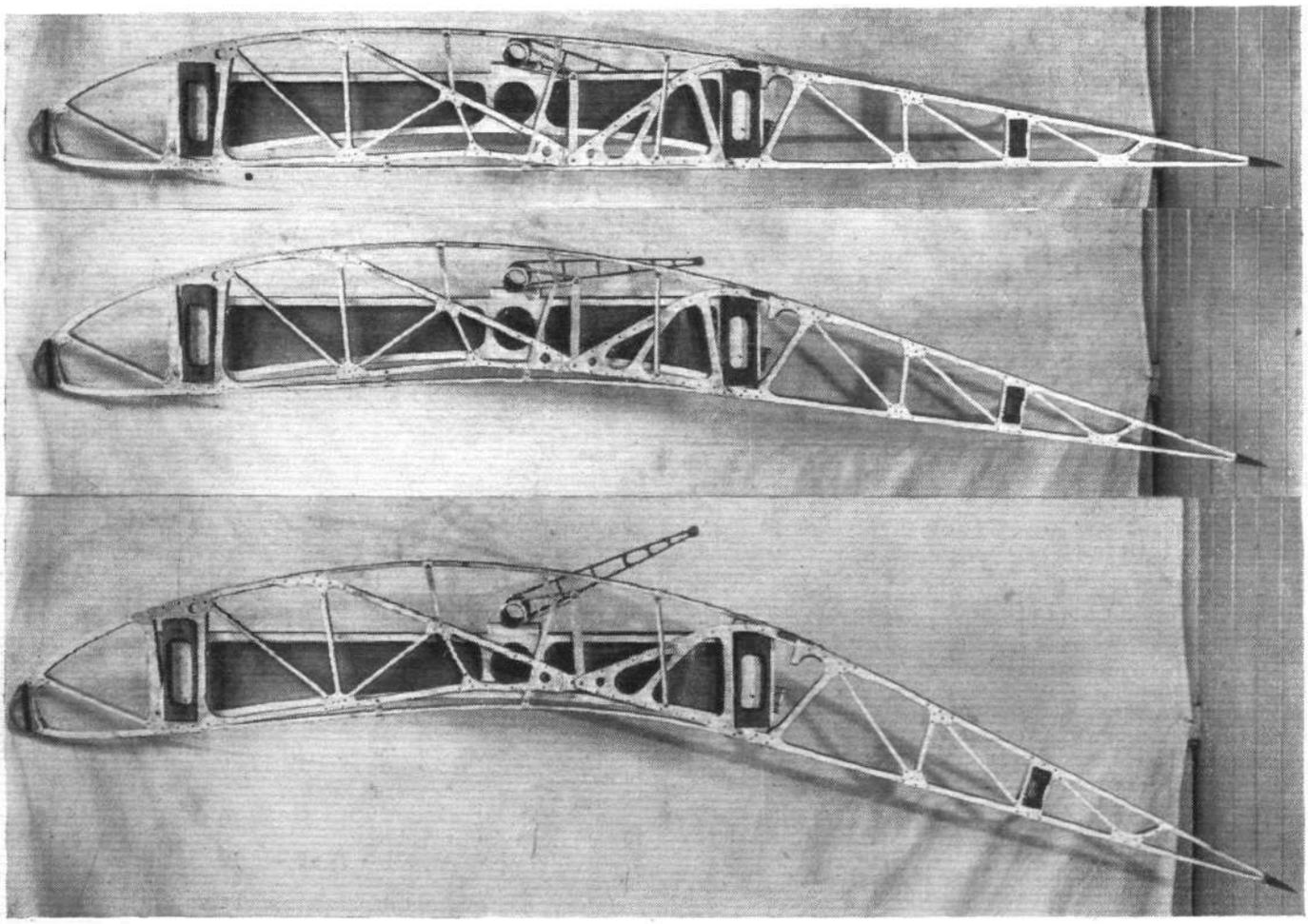
Signor Antoni has, in his latest type of variable-camber wing, incorporated the results of many years of experience, and it would appear that he has evolved a system of construction which is practical from an engineering standpoint, although naturally the wing will be somewhat heavier than a plain fixed wing.

The principle of the Antoni variable-camber wing will be readily understood from the three photographs of a demonstration rib, which show the rib in the two extreme and intermediate positions.

Briefly explained, the camber gear of the Antoni wing consists in hingeing the nose and trailing edge portions of the rib to the wing spars, with levers projecting towards the middle of the wing chord, these levers with their operating mechanism forming a sort of toggle. The rib flanges or booms continue right across the rib, and are braced to the toggle levers by short ties, so that as the leading and trailing edges are depressed by raising the toggles, the top and bottom flanges of the middle portion of the rib follow their movement and maintain a smooth rib contour.

The photographs show the great degree of camber variation which is possible. It will be observed that the toggle lever of the trailing edge is shorter than that of the leading edge. This is, of course, done in order that the angular movement of the trailing edge may be greater than that of the leading edge. In this way not only is the angle of incidence increased as the camber is increased, but Signor Antoni claims that the resulting curvatures are such that no shift of the centre of pressure occurs. Obviously this is a great advantage.

In the actual wing to be built by the Gloster Company only every fourth rib will be operated. Between every pair of operated ribs there will be three auxiliary ribs of lighter construction, which will automatically follow the curvature of the main or controlled ribs. This arrangement

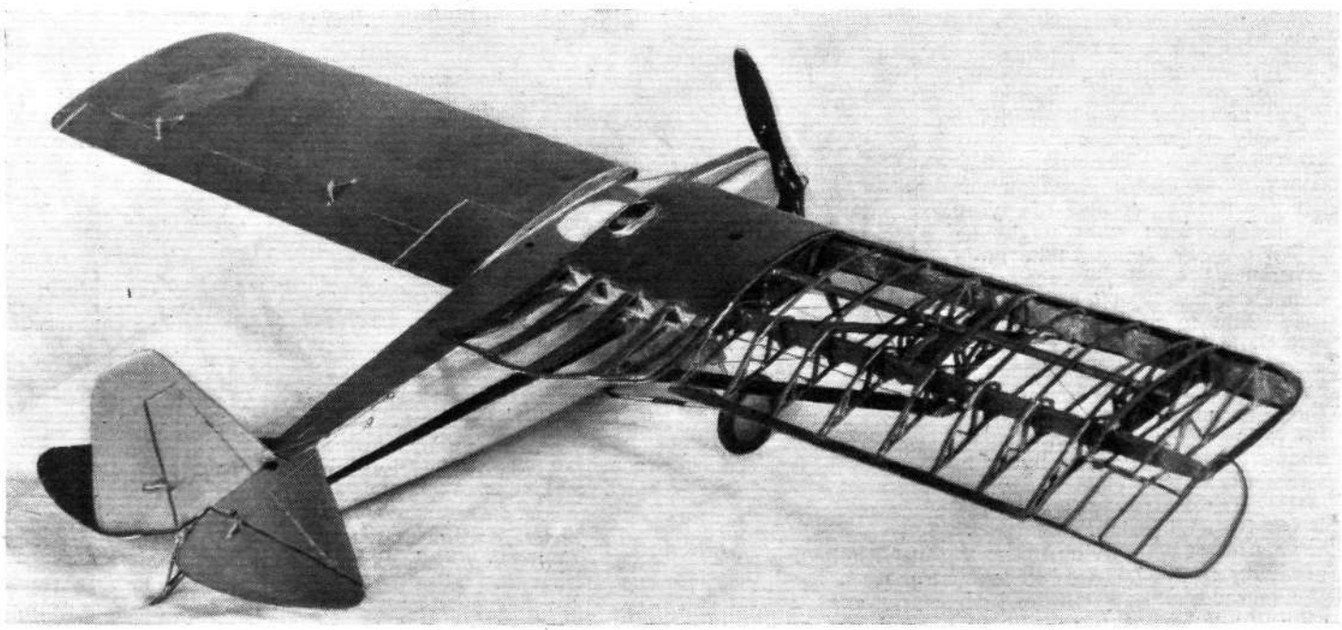


THE ANTONI VARIABLE WING: The upper photograph shows a demonstration rib in the position of minimum camber, i.e., with the lower surface flat. The lower photograph shows the maximum camber attainable, while in the central picture an intermediate camber position is illustrated. Note that incidence as well as camber is changed. (FLIGHT *Photos.*)

permits of arranging the internal drag bracing in the orthodox manner, which would not have been possible had all ribs been of the operated type.

To avoid complication with ailerons forming the trailing edge of the variable-camber wing, it is not intended to carry the variable camber right out to the wing tips, but to leave the outer few feet of wing of normal fixed construction, so that ailerons of normal type, although of short span, can be fitted here. It would have been possible so to design the camber-operating mechanism that lateral control was achieved by the variation of camber, but it was thought that for a first wing this complication might better be avoided.

Near the root of the wing will be seen, in the photograph of the model of a "Breda" monoplane, a peculiar up-curved extension of the trailing edge. This is another Antoni patent, and is intended to give fore and aft stability to the wing. Signor Antoni has made many models of gliders, and the degree of stability he has obtained in model wings devoid of tails other than these flexible stabilisers is astounding. What one particularly notices is the total absence of phugoid oscillations when the model glider is first launched. The glider picks up its proper attitude *instantaneously* without that hunting up and down which is apt to characterise any small model when it is first launched by hand, and before it has steadied down to its glide. It is the flexibility of the stabiliser which is responsible for this.



MODEL OF UGO ANTONI WING : A variable camber wing has been mounted on one side of a model of a Breda monoplane, leaving the standard wing on the other side for comparison. The extended trailing edge near the fuselage is a flexible stabiliser. (FLIGHT *Photo.*)

Of the sort of increase in speed range which the Antoni variable-camber wing will give, it is difficult to judge. Looking at the demonstration rib, one imagines that in its flat form it may have a maximum lift coefficient of approximately 0.5 in British "absolute" units. It also seems likely that with the wing curved to its maximum camber, the maximum lift coefficient may be increased to something like 0.8, or possibly even a little more. Wind-tunnel tests on wings of deeply cambered section have rarely been persuaded to give a greater maximum lift coefficient than that.

If we assume that this is the maximum of the Antoni wing, and that the wing loading is 8 lb./sq. ft., the minimum speed with the wing "flat" would be about 56 m.p.h. If the maximum lift coefficient can be increased to 0.8, the minimum speed at that wing loading would be reduced to something like 44 m.p.h., a reduction for this wing loading of 12 m.p.h.

Reduction in landing speed, or in other words increase in speed range, is not, however, the only advantage to be expected from a variable-lift wing. The tendency in modern aircraft is towards greater aerodynamic refinement, and the high-efficiency aeroplane has a habit of "floating" when being brought down for a landing, and the change of the wing into a high-lift one, because of its poor lift/drag ratio, will alter the gliding angle into a steeper one, and so give a certain degree of control over the gliding angle. In other words, the deep camber will at the same time act as an air brake and allow the machine to descend always with its fuselage approximately horizontal, unless, of course, the pilot uses his controls to make it do otherwise.

Owing to the fact that the angle of incidence as well as the camber is increased, it may be expected that the landing run following a steep glide will be short, not only because the flight path in a glide is steep, but also because with the wing at a large angle to the fuselage, as soon as the wheels have touched and the tail drops, the wing will be at a very large ground angle, will have passed its angle of maximum lift, and will not, therefore, cause the machine to rise again, but *will* help materially in bringing the machine to a standstill.

So far we have considered the variable-camber wing mainly as a means of increasing the speed range (Signor Antoni estimates that a speed range of something of the order of 4:1 should be attainable) and its use for causing a steep glide, with corresponding short run after landing. There is, however, another direction in which this type of wing may be expected to be beneficial. As an aircraft reaches a greater and greater height, it should, theoretically, alter its lift coefficient to suit the new conditions. This the Ugo Antoni wing will readily do by changing its camber, and it may thus be expected that for machines designed to operate at considerable altitudes a perceptible improvement in the rate of climb can be achieved by suitable use of the camber gear. Similarly, it may be expected that the ceiling will be improved.

In the case of multi-engined aircraft, it is conceivable that the variable-lift wing will also have certain advantages. If one of the engines stops, the aircraft will have to fly at a somewhat reduced speed, unless the remaining engines are to be run at much increased power. The reduced speed may not correspond to the best efficiency of the machine unless the wing camber, or in other words the lift coefficient, can be made to suit the lower speed. Thus the Ugo Antoni wing may be found to improve the cruising efficiency and thereby save fuel.

The Antoni-Gloster experiment is designed to discover, full scale, how much there is in the variable-lift wing in which the variation in lift is obtained by varying the camber. It is impossible to forecast what the results will be. Wind-tunnel tests would be of little value in a case like this, where so many other features play a part, and full-scale trials seem to be the only satisfactory way of solving the problem. The tests will be watched with the greatest interest.

Training of Pilots and Instructors

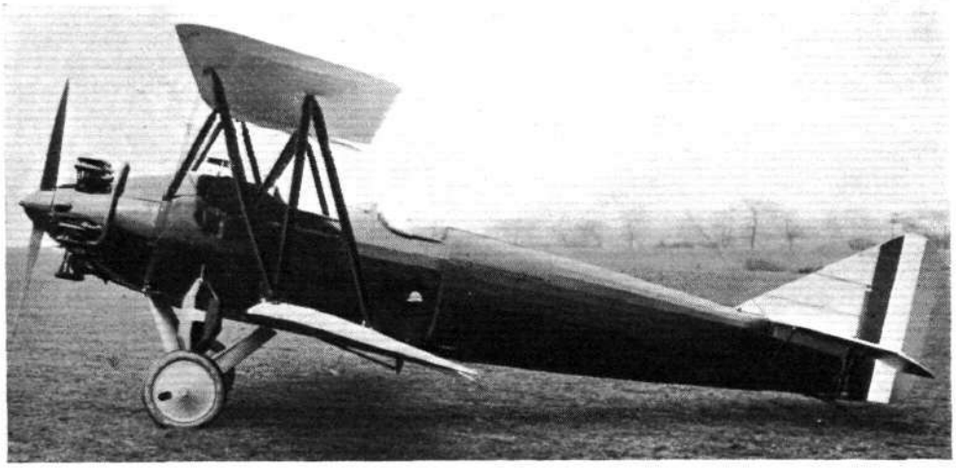
By GROUP CAPTAIN J. E. A. BALDWIN, D.S.O., O.B.E.

(*Continued from page* 451.)

Instrument Flying

I HAVE not touched on instrument flying as this is still in its primary development stage in so far as this country is concerned. We were slow to recognise the necessity for this, although a start was made in instrument flying in 1918. Further research was allowed to lapse, and this branch of flying was only seriously taken up about 18 months ago. The present tendency is to regard it as an entirely separate method of flying as distinct from what might be called sensory flying. The more experienced a pilot is the more difficult it has been found to persuade him to fly entirely by instruments. At the present moment, apart from a complicated system of wireless beams, there is no accurate method of informing a pilot as to his height above the ground when flying in fog. Otherwise the instruments as they exist to-day enable a pilot after approximately ten hours' tuition to fly accurately, although he is bereft of all vision.

This instrument flying opens up an entirely new system of flying training. Are we to continue sensory flying by the methods I have outlined above, or are we to teach pilots to fly entirely by instruments in future?



A MODERN TRAINING MACHINE: The Avro "Tutor," or 621, with Armstrong-Siddeley "Lynx engine, is a worthy successor of the 504. (FLIGHT *Photo.*)

Characteristics of Ideal Training Aircraft

The ideal training aircraft is one that reproduces to a marked degree all the characteristics of the modern high-powered service type, thereby rendering any intermediate training type unnecessary.

It must, however, be sufficiently light to be capable of being handled by one man when on the ground. It is essential that any training aircraft should be entirely free from any vice. It is further suggested that the tandem method of seating with the pupil in front, provided adequate telephonic communication is ensured, is better than the side-by-side system—blindness on one side in a congested area. The following are what I consider to be essential assets of training aircraft:—

(*a*) *Taxying.*—Must be fully controlled on the ground in all weather, tailskid or wheel controlled by rudder bar.

(*b*) *Controllability.*—Controls must be light, progressive and powerful. All three in harmony. Ailerons to retain control nearly up to stalling point and then to give definite warning of a stall.

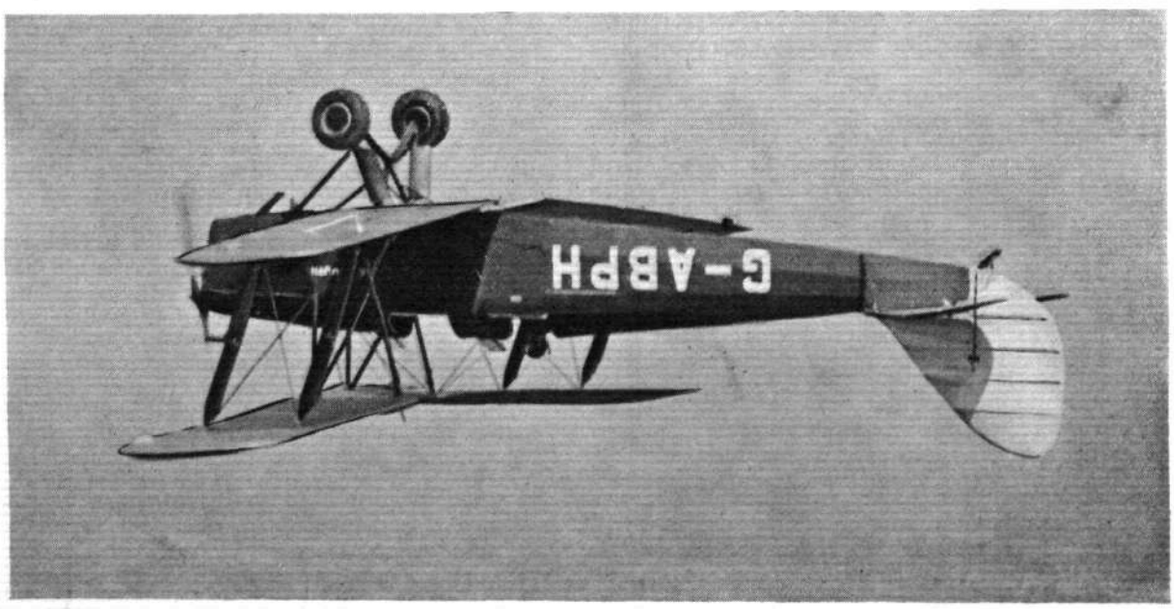
(*c*) *Stall.*—To stall at a low speed, *i.e.*, approx. 40 m.p.h., and recovery effected with small loss of height.

(*d*) *Take-off.*—Get off reasonably quickly with two up.

(*e*) *Landing.*—Not too easy, requires feel before it can be landed really well.

(*f*) *Gliding.*—Angle of glide comparatively flat, affording ample time for practising gliding turns, and resembling the angle of glide of the average modern aircraft. Not easily stalled on a gliding turn.

(*g*) *Spinning.*—Should show reluctance to spin except when deliberately stalled and full rudder applied, and recover readily when correct action is taken without excessive loss of height.



INVERTED FLYING TRAINING: The de Havilland "Tiger Moth" (Gipsy III engine) can be used for training in this as in any other evolution. (FLIGHT *Photo.*)

(*h*) *Side-slipping.*—Capable of being side-slipped in the normal manner.

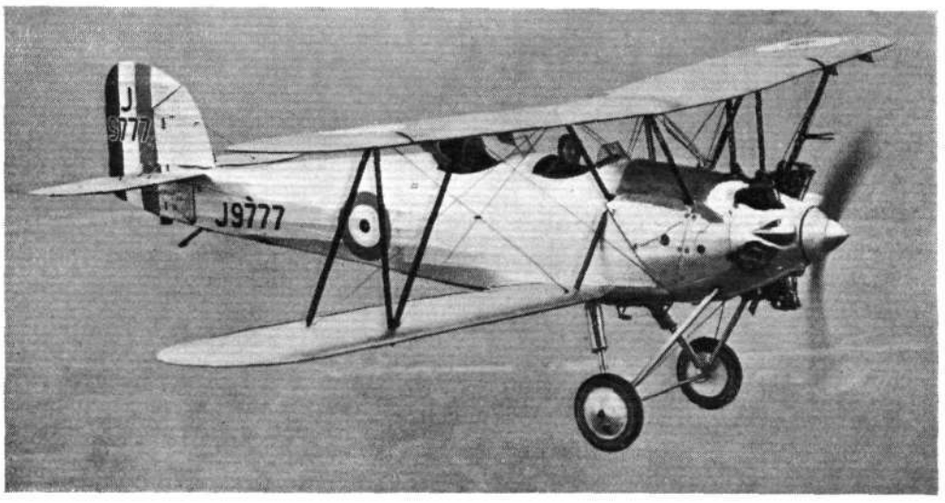
(*i*) *Take-off and Landing Across Wind.*—Undercarriage neither too wide nor too low to allow for a relatively steep inclination of wings on the ground for taking off or landing across wind.

(*j*) *Aerobatics.*—Has the necessary performance, strength and flying qualities to carry out all normal aerobatics when flown by a pupil.

(*k*) *Visibility.*—Should be excellent in all directions. Top plane must not unduly interfere with the range of vision from the front cockpit.

(*l*) *Position.*—Both cockpits close together. The normal pilot's position to correspond with that in the modern service aircraft.

(*m*) *Entry and Exit.*—Front cockpit not to be directly under the centre section. The entry and exit to both cockpits to be unobstructed by struts or wires.



FITTED FOR "BLIND" FLYING: The Hawker "Tomtit" (Armstrong-Siddeley "Mongoose" engine) has a hood over the rear cockpit, used for teaching flying entirely by instruments. (FLIGHT *Photo.*)

(*n*) *Maintenance.*—Ease of maintenance is an essential. Good clear access to controls by methods such as removable panels covering the sides of both cockpits. Sufficient space between engine and bulkhead to allow repairs and replacements to magnetos, oil pipes, etc.

(*o*) *Comfort.*—Both seats adjustable by hand-levers for height. Harness anchored to fuselage and not to seat so that it may be adjusted for aerobatics by merely heightening the seat. Rudder bar adjustable for distance by hand-operated wheel. Sufficient padding in front of cockpit to minimise risk of head injuries, carefully designed wind screens to reduce draughts to a minimum. All instruments on dashboard clearly visible.

(*p*) *Fuel Capacity.*—Fuel capacity of at least three hours, so as to avoid unnecessary refuelling.

(*q*) *Performance.*—Adequate climb to prevent loss of time between lessons or manœuvres and possessing a top speed of not less than 110 m.p.h.

(*r*) *Ballast.*—Tail adjustment by wheel, range large enough to allow aircraft to be flown solo from cockpit without ballast.

(*s*) *Undercarriage.*—Capable of withstanding heavy shocks, but sufficiently resilient to show up bad landings.

DE LUXE TRAINING: The Hawker "Hart Trainer" (Rolls-Royce "Kestrel" engine) is the most recent addition to the series of training aircraft. (FLIGHT *Photo.*)

The "Sywell Windstocking"

IT is with regret that we have heard of the passing of the *Sywell Windstocking*. It has been found impossible to carry on this publication, which is the Journal of the Northamptonshire Aero Club, as insufficient advertisement space has been taken to cover the cost of production. That yet another club journal should find the present economical pessimism too much for it is not surprising, but it is to be deplored, for the maintenance of their own journal is a thing which invariably tends to hold club members together. The *Windstocking* has always been well run and certainly worth reading, and we hope that it may be looked upon as merely dormant and thus likely to blossom again when watered with adequate finance in the not too far distant future. We offer our sympathy to the Hon. Editor, Mr. S. P. Tyzack, who has lately put in so much of his time and energy trying to keep it alive.

The Industry

SCINTILLA AIRCRAFT MAGNETOS

THE PARTICULAR technical feature of the Scintilla aircraft magneto—the type associated with most of the successful Atlantic flights and so many notable long-distance flights throughout the world, including the recent Atlantic crossing by Miss Amelia Earhart—is its inverse system, which causes its permanent magnet and most robust part to rotate, and its delicate parts, such as the contact breaker with contact points and the coil, to remain stationary.

This system results in the magneto successfully withstanding the worst vibration and giving a regular and efficient output at high speeds. In these days, with high compression ratios, supercharging and ground boosting, the magneto has to be designed in many cases for speeds of 7,000 r.p.m. for short-life racing engines, and 5,500 r.p.m. for a duration of more than 500 hr.

Scintilla magnetos are manufactured for engines ranging from 2 to 24 cylinders, and of small dimensions and minimum weight. They can be supplied with substantial flanges for flange fitting to either British or Continental standards. Bonding or screening to prevent interference with the wireless apparatus can be incorporated in all types, and provision is made for any degree of automatic advance and retard.

An automatic spark control produced for Scintilla magnetos is arranged between the magnet poles, and is a satisfactory means of giving an engine the correct spark advance in relation to its speed. As the normal running speed of an aero engine is always in excess of 1,300 r.p.m. and the idling speed not more than 500 r.p.m., the spark advance has to take place between 600 and 1,200 r.p.m. The characteristic curve of the spark advance can be altered by using different governor springs. In this way it is possible to provide a fully retarded spark for starting and idling speed, also a fully advanced spark for the normal running speed. Scintilla magnetos with automatic spark advance are of the same overall dimensions as the normal machines, as the automatic device is incorporated in the rotating magnet ; no special provision need therefore be considered by engine designers desiring to fit magnetos with this device.

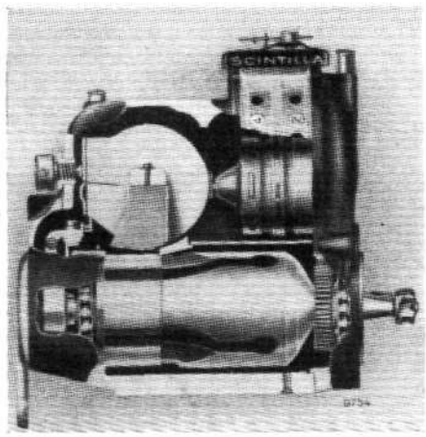
A Scintilla magneto for hand starting is produced, mounted on the instrument board. For starting the engine with this type the ignition system is switched off and the propeller turned to suck in a charge into the cylinder. Ignition is then switched on and the handle of the starting magneto turned, causing sparks in the cylinder which is on the firing stroke. This hand-starter magneto is cased in bakelite and is therefore very light.

Other equipment produced by the Scintilla Company includes switchboards which enable the pilot to switch off either magneto in order to test the working of the magneto still in operation, and further, to check the firing of each series of plugs.

In connection with the screening of magnetos to reduce interference to the wireless there is an interesting device in the nature of a small choke fitted directly to the plugs, which has no detrimental effect on the sparking at the plug points.

Scintilla aircraft dynamos are manufactured for various capacities, *i.e.*, 300 to 1,225 watts, 12 to 24 volts. Special louvres and holes to ensure cool running are provided in the housing.

A large range of flexible couplings for magneto driving are also made. Mounting and dismantling is thereby simplified, axial as well as radial friction eliminated, and ample protection against vibration is provided. Variations in timing can be made without slipping back or removing the magneto, and accurate setting is obtained by means of a Vernier adjustment screw.



Scintilla Magneto Type GN8-D sectionalised.

The London office of Scintilla, Ltd., is 14, Clerkenwell Close, E.C.1.

C.F.S. TO CHANCERY LANE

FLT. LT. W. E. P. JOHNSON, whom everyone in aviation has known for many years as the acknowledged authority on instrument flying, and also for his amazing displays of inverted flying at many of our flying meetings, has now joined the firm of F. J. Cleveland & Co., Bank Chambers, 29, Southampton Buildings, Chancery Lane, London, W.C.2 (Holborn 5876), as a Patent Agent. Mr. Cleveland himself was actively interested in flying as far back as 1910, when he was connected with the design of an aircraft shown by Humbers at Olympia in 1911. Flt. Lt. Johnson qualified as a Patent Agent before he joined the R.A.F. in 1925, and his knowledge, therefore, of this business, together with his unique experience in the R.A.F., should stand him in good stead in helping his firm to specialise to a certain extent in aeronautical cases, particularly those of a consultant nature, in which Mr. Johnson's qualification as a pilot will be useful, as, for example, in matters where expert evidence is required. The amount of business which is done in aircraft patents is growing very rapidly, and just as in 1895 the introduction of the pneumatic tyre and the combustion engine caused an unprecedented rise in the number of patents taken out for road transport work connected with these two matters, so the present-day growth of aircraft for transport will cause yet another similar rise.

DISENGAGED

MR. H. W. GRAVENELL, who has been employed by Saunders-Roe, Ltd., for the past six years in the organising of their Marine Service Station and for sales and publicity of the aircraft and boat-building section of their business, has now severed his connection with that firm. He is, therefore, open to consider any other appointment. Mr. Gravenell's many years' experience in aviation publicity should be of great value, particularly to some of the firms whose activities are of comparatively recent date and may not, therefore, be as *au fait* with the inner workings of the aviation business as is Mr. Gravenell.

L. & P. CHANGE ADDRESS

THE LONDON & PROVINCIAL AVIATION CO., which has been started by Mr. S. J. Gilbert, has now moved to larger and more convenient premises at 3, Thackeray Street, Kensington Square, London, W.8 (Western 4354/5). An arrangement has been come to with the Kensington Square Garage, of 7/11, Ansdell Street, W.8, for repair work of all descriptions to be undertaken, and a booking office has been established whereby seats on the ordinary air lines may be booked or air taxis ordered at short notice. Another attraction will be a showroom containing a wide selection of accessories of all types, and arrangements can be made for the cash or hire-purchase of new and secondhand aircraft or motor cars. Aircraft and general insurance can also be arranged at very low terms. Among the particular lines handled at the moment are L. & P. Aviation suits, Orpi cleaning compounds and the aircraft light equipment of the Hendon Lamp & Accessories Co., Ltd.

THE ROYAL AIR FORCE

London Gazette, May 17, 1932.

General Duties Branch

The following Pilot Officers are promoted to rank of Flying Officer :—C. L. Monckton (Jan. 12) ; H. R. A. Edwards, J. M. Freeman, A. L. Holland (April 24) ; K. R. Warton (April 28). Sqdn. Ldr. A. Rowan is placed on half-pay list, Scale A (May 14) ; Air Commodore J. L. Forbes, C.B.E., is placed on retired list at his own request (May 13) ; Wing Commander W. R. Read, M.C., D.F.C., A.F.C., is placed on retired list at his own request (May 17) ; F./O. C. P. F. Alderson relinquishes his short service commn. on account of ill-health (May 16) ; F./O. G. Calvert is dismissed the Service by sentence of General Court Martial (May 13).

Stores Branch.

Flt.-Lt. N. Dainty is placed on retired list (May 16).

ROYAL AIR FORCE RESERVE
RESERVE OF AIR FORCE OFFICERS

General Duties Branch

Pilot Officer H. B. G. Michelmore is promoted to rank of Flying Officer (May 18) ; F./O. R. H. Giles relinquishes his commn. on completion of service (May 14). The commns. of the following Pilot Officers on probation are terminated on cessation of duty (April 22) :—J. R. McCready, T. G. F. Mathers.

SPECIAL RESERVE.

Medical Branch.

R. H. Vartan is granted a commn. as Flying Officer (April 19).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Squadron Leaders : F. J. Vincent, D.F.C., to H.Q., Air Defence of Gt. Britain, Uxbridge, 14.5.32, for Personnel Staff duties *vice* Flt.-Lt. H. J. Collins. D. W. Clappen, to School of Tech. Training (Men), Manston, 13.5.32, for Engineer duties *vice* Sqd.-Ldr. E. J. Cuckney, D.S.C.

Flight Lieutenants : R. R. Nash, to R.A.F. Training Base, Leuchars, 26.4.32. G. Bartholomew, to R.A.F. Depot, Uxbridge, 9.5.32. R. B. Sutherland, D.F.C., to No. 10 (B) Sqdn., Boscombe Down, 5.5.32. J. F. Clark, to Central Flying School, Wittering, 30.4.32. E. E. Arnold, D.F.C., to No. 84 (B) Sqdn., Shaibah, Iraq, 6.5.32. H. Thomas, to No. 13 (A.C.) Sqdn., Netheravon, 5.5.32. G. N. J. Stanley-Turner, to R.A.F. Depot, Uxbridge, 5.5.32. L. R. W. Tillard, to No. 26 (A.C.) Sqdn., Catterick, 25.4.32. W. G. Woolliams, to No. 501 (B) Sqdn., Filton, 9.5.32.

Flying Officers : A. J. Tunnard, to Central Flying School, Wittering, 18.4.32. G. F. Humphries, to No. 58 (B) Sqdn., Worthy Down, 3.5.32. D. G. Morris, to R.A.F. Base, Gosport, 5.5.32. E. J. Gracie, to R.A.F. Base, Gosport, 5.5.32. G. Francis (since promoted Flt.-Lt.), to H.Q., Coastal Area, Lee-on-the-Solent, 21.3.32. L. E. Chiswell, to School of Army Co-operation, Old Sarum, 2.5.32.

Pilot Officer R. C. Gaskell, to R.A.F. Base, Gosport, 5.5.32.

Medical Branch

Flight Lieutenant E. K. Pritchard, to Station H.Q., Duxford, 9.5.32.

Dental Branch

Flight Lieutenant G. A. Ballantyne, D.F.C., to No. 1 School of Tech. Training (Apprentices), Halton, 12.5.32.

Flying Officers : F. B. Sumerling, to H.Q., Coastal Area, Lee-on-Solent, 18.1.32. P. J. C. Keane, to R.A.F. Depot, Uxbridge, 12.5.32

Chaplains Branch

Revd. H. F. Daniels, to H.Q., R.A.F., Middle East, Cairo, 6.5.32, for duty as Chaplain (Wesleyan).

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty :—

PROMOTIONS

LIEUTENANTS.—J. G. Farrant, W. S. Lea (F/O., R.A.F.), to rank of Lt.-Com. (seny. May 15).

ROYAL AIR FORCE

FLIGHT LIEUTENANTS : N. S. Allinson, to R.A.F. Depot (March 26) ; and G. R. M. Clifford, to R.A.F. Base, Gosport (April 27).

FLYING OFFICERS : A. le R. S. Upton, to R.A.F. Depot (April 27) ; and W. K. Beisiegel, to Central Flying School (May 16).

The Royal Air Force Memorial Fund

The second meeting of the newly constituted Council of the above Fund was held at Iddesleigh House on May 18. Owing to R.A.F. Sports being held at various Headquarter Stations throughout the Kingdom, there was a small attendance of members of the Council. At the commencement of the proceedings the Chairman welcomed to the Council the Revd. S. L. Clarke, M.A., Chaplain-in-Chief to the Royal Air Force. After the usual financial resolutions had been approved, the Chairman announced the resignation from the Council of Air Vice-Marshal C. A. H. Longcroft, C.B., and this resignation was accepted with very great regret, the Vice-Marshal having been practically a continuous member of the late Executive Committee since the Fund was started in 1919. The attention of the Council was drawn to the recent cleaning operations which took place at the R.A.F. War Memorial on the Victoria Embankment, and which work was carried out very excellently by Messrs. Vigor & Co., Ltd., of Poplar, E.C. The Secretary informed the Council that 1,500 copies of the Annual Report of the Fund for 1931 were issued to all concerned in the early part of April last. The attention of the Council was also drawn to the fact that the R.A.F. Thirteenth Display would be held at Hendon on Saturday, June 25, next, and that tickets for boxes and the 10s. and 5s. enclosures could be purchased at the offices of the Fund, as well as at Hendon and through all Theatre Agencies. The next Meeting of the Council, as already fixed, will be held at the offices of the Fund on Wednesday, July 6, at 3 o'clock.

R.A.F. Dinner Club

THE 10th Annual Dinner of the R.A.F. Dinner Club will be held at 8.30 p.m., on Friday, June 24, at the Connaught Rooms. Membership of the club is open to all serving R.A.F. officers, and past officers of the R.A.F., R.F.C., or R.N.A.S. The Honorary Secretary is Flight-Lieut. W. M. Yool, Air Ministry, Kingsway, W.C.2, from whom particulars and forms of application for membership can be obtained.

FLIGHT LIEUTENANT F. G. GIBBONS

THE tragic loss of Flt. Lt. Frank George Gibbons during the race organised by the *Morning Post* on Saturday, May 21, was one which came as a shock to his many friends. It would appear fairly certain that his death was due to his colliding with a tree while looking at his maps inside the cockpit, and was in no way caused by any defect in the "Spartan" three-seater he was flying at the time. He was a particularly likeable character, besides being an outstanding expert as a pilot. He was one of those people about whom one never heard any gossip, and his likeable character is shown by the fact that although he was the best of companions at the kind of party which usually finishes an air meeting, he was equally at home spending an afternoon playing with young children. He first joined the R.F.C. in June, 1917, as an air mechanic (cadet), and gained his commission in November of the same year. He was gazetted as a Flt. Lt. on June 1, 1926, and won the D.F.C. for services in the field. Not only was he a very fine pilot of land aircraft, but also of flying boats. On January 5, 1931, he went to Calshot, and from there he was posted to No. 204 Flying Boat Squadron at Mountbatten, Plymouth, of which he was a member at the time of his death. He was a brilliant navigator, and this form of race was one in which he was particularly interested. It is perhaps, therefore, some consolation to feel that if he himself could have had the choice, he would have undoubtedly have chosen to die when flying "flat-out" during such a race, in the manner he did. The funeral took place at Ipswich on Wednesday, May 25. He was 33 years of age and unmarried.

MAJOR I. N. C. CLARKE

WHEN returning from Londonderry on Sunday last, May 22, Maj. Irwin Napier Colin Clarke was killed when the "Desoutter" monoplane he was flying hit a rocky gorse-covered hillside at Stranraer ; his passenger, Mr. Ernest Victor Barton, a photographer on the staff of the *Daily Sketch*, also lost his life. It would appear that he lost his way in a dense fog and that the machine struck a knoll which caused it to somersault down the hillside for some distance. Both Maj. Clarke and Mr. Barton were thrown out of the machine some 40 yd. beyond it. Maj. Clarke was a director and the chief pilot of Personal Flying Services, Ltd., an independent air-taxi business which has been doing particularly well ferrying passengers to Le Touquet and all over Europe. While flying during the war he was awarded the D.F.C. "for conspicuous good work" as pilot of bombing planes, and later earned a Bar to the D.F.C. and was several times mentioned in dispatches. "Nobby" Clarke was a very fine pilot, and when doing Press work in his "Junkers" monoplane had often made some spectacular flights. It will be remembered that he had extremely bad luck when returning from Abyssinia with Press photographs of the coronation of the King. He was well ahead of all the other aircraft, but was only beaten in the end by a severe bout of influenza. He had that great asset of being able to take things as they came and never being pessimistic, and we well remember one occasion when we went to Southampton with him to take delivery of a new "Sikorsky" amphibian for his business ; on arrival we found it at the bottom of the river owing to a severe gale the previous night. Most people would have taken this setback somewhat hardly, but not so "Nobby," and by the evening of the same day that machine was on the slipway ready to go into the works for overhaul on the following morning. His loss will be felt most keenly by that wide circle of society which used his aircraft for their trips to France, as his reputation for safe and careful pilotage under most difficult conditions was responsible for their conversion to aerial travel. The funeral will take place on Friday, May 27, at 12 p.m., at Westminster Cemetery, Hanwell.

AIRCRAFT COMPANIES' STOCKS AND SHARES

THERE has not been a great deal of activity during the past month in the stock and share markets outside British Government securities, interest in which was naturally further stimulated by the latest reduction in the bank rate. Industrial shares moved against holders on balance for the month, but at the time of writing have developed a better tendency, support being rather more noticeable. Whilst shares of companies connected with the aircraft and allied industries have naturally reflected the general trend, there are no heavy declines on balance for the month. Fairey Aviation lost 6d. on the month to 13s. 3d., but have remained a steady market on the company's good position. Although the continued difficulties of the international financial situation will presumably make it less easy to obtain orders from foreign governments, there seem reasonable grounds for the view that the dividend will be maintained at 10 per cent. net, for in respect of the past year the latter was earned with a margin of nearly 13 per cent. De Havilland have not attracted much attention and during the month the quotation has declined from 16s. 3d. to 13s. 3d. Imperial Airways also lost 1s. to 14s. 6d. during the same period. D. Napier have kept virtually at last month's lower price, but there has been some selling of the preference shares. The next half-yearly dividend on the 7½ per cent. preference shares falls to be paid on June 30. Possibly, when making the formal announcement of the dividend, the directors may also give shareholders some indication of the company's progress. Handley Page participating preference have been on offer and are quoted at 7s. 6d., or 1s. lower than a month ago; the annual report has not been published at the time of writing, but it can be expected any time now. Rolls-Royce held up well at 33s. 9d. No change has been shown by Petters ordinary or preference; quotations have not been tested by business during the month. Sheffield prices of Thomas Firth & John Brown are not quotably affected at the time of writing by the past year's results. The lower prices for both Joseph Lucas and Triplex Glass are attributed partly to fears that profits may be affected by the less satisfactory conditions reported to be ruling for motor-car manufacturers. There is talk in some quarters of the market that Joseph Lucas' dividend may be "cut" to 15 per cent. It may be recalled, however, that on the last occasion the company's results were in excess of market anticipations. Ford Motor have yielded 1s. 6d. to 20s. during the month, but at the time of writing have not been quotably affected by current market talk of production changes affecting the English company. "Shell" have gained 1s. 6d. on balance, aided by the results, which proved to be up to the best expectations.

Name.	Class.	Nominal Amount of Share.	Last Annual Dividend. %	Current Week's Quotation.
Anglo-American Oil	Deb.	Stk.	5½	100½
Armstrong Siddeley Develop.	Cum. Pref.	£1	6½	13/9
Birmingham Aluminium Castg.	Ord.	£1	5	18/6
Booth (James), 1915	Ord.	£1	15	42/–
Do. do.	Cum. Pref.	£1	7	23/6
British Aluminium	Ord.	£1	5	21/3
Do. do.	Cum. Pref.	£1	6	20/–
British Celanese	Ord.	10/-	Nil	6/–
British Oxygen	Ord.	£1	3	11/3
Do. do.	Cum. Pref.	£1	6½	20/–
British Piston Ring	Ord.	£1	10	25/–
British Thomson-Houston	Cum. Pref.	£1	7	24/9
Brown Brothers	Ord.	£1	10	26/3
Do. do.	Cum. Pref.	£1	7½	23/9
Dick (W. B.)	Cum. Pref.	£10	5	115/–
De Havilland Aircraft	Ord.	£1	5	13/3
Dunlop Rubber	Ord.	c	Nil	10/6
Do. do.	"C" Cum. Pref.	16/–	10	13/9
En-Tout-Cas (Syston)	Def. Ord.	1/–	Nil	1/–
Do. do.	Ptg. Pfd. Ord.	5/–	8	2/6
Fairey Aviation	Ord.	10/–	10*	13/3
Do. do.	1st Mt. Deb.	Stk.	8	105
Firth (T.) & John Brown	Cum. Pref.	£1	6D	7/6
Do. do.	Cum. Pref.	£1	5*D	6/–
Ford Motor (England)	Ord.	£1	Nil	20/–
Fox (Samuel)	Mt. Ptual. Deb.	Stk.	5	72½
Goodyear Tyre & Rubber	Deb.	Stk.	6½	99
Handley Page	Ptg. Pref.	8/–	12½	7/6
Hoffmann Manufacturing	Ord.	£1	Nil	15/1½
Do. do.	Cum. Pref.	£1	7½	13/9
Imperial Airways	Ord.	£1	3	14/6
Kayser, Ellison	Ord.	£5	Nil	55/–
Do. do.	Cum. Pref.	£5	6	75/–
Lucas (Joseph)	Ord.	£1	20	53/9
Napier (D.), & Son	Ord.	5/–	Nil	3/4½
Do. do.	Cum. Pref.	£1	7½	19/4½
Do. do.	Pref.	£1	8	13/9
National Flying Services	Ord.	2/–	Nil	–/4½
Petters	Ord.	£1	6	17/6
Do.	Cum. Pref.	£1	7½	17/6
Roe (A.V.) (Cont. by Armstrong-Siddeley Devel., *q.v.*)	Ord.	£1	—	—
Rolls-Royce	Ord.	£1	10	33/9
Smith (S.) & Sons (M.A.)	Def. Ord.	1/–	Nil	1/3
Do. do.	Pt. Pfd. Ord.	£1	7	12/6
Do. do.	Cum. Pref.	£1	7½	15/–
Serck Radiators	Ord.	£1	15	29/6
"Shell" Transport & Trading	Ord.	£1	7½*	35/–
Do. do.	Cum. Pref.	£10	5	£10⅛
Triplex Safety Glass	Ord.	£1	10	30/–
Vickers	Ord.	6/8	5	6/1½
Do.	Cum. Pref.	£1	5*	15/6
Vickers Aviation (Cont. by Vickers, *q.v.*)	—	—	—	—
Westland Aircraft (Branch of Petters, *q.v.*)	—	—	—	—

* Dividend paid tax free. c £1 unit of stock. D Last xd. on March 19.

The Royal Tournament

THE forty-ninth of the series of Royal Tournaments was opened at Olympia on May 25 in the presence of Their Majesties the King and Queen. These tournaments, as our readers are doubtless aware, are displays by the Navy, Army and Air Force, and the proceeds are devoted to service charities. During the last five years these charities have benefited to an average annual extent of £25,000 from the Royal Tournaments, but even this is insufficient for all needs. Readers of FLIGHT are reminded that by visiting Olympia they are not only helping a very worthy cause, but will enjoy themselves immensely; of that we have not the slightest doubt. Each year one comes away with the feeling that next year's Tournament cannot possibly be better. Yet as regularly it *is* even better than before. The share of the Royal Air Force consists in a display of physical training, and, as previously, the standard is very high indeed.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda: No. 1439. *Effects of Sideslip on Rolling and Yawing Moments.* By F. B. Bradfield and A. S. Hartshorn. June, 1926. Price 6d. net. No. 1442. *Motions of a Stalled Bristol Fighter Fitted with Auto-Control Slots and Interceptors.* By A. Omerod. Oct., 1931. Price 4d. net. London: H.M. Stationery Office, W.C.2.

Aeronautical Research Committee Reports and Memoranda: No. 1435. *Dimensional Stability of Heat-Treated Aluminium Alloys.* By J. D. Grogan and D. Clayton. December, 1931. Price 1s. net. London: H.M. Stationery Office, W.C.2

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. (The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1931.

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2,312. J. FRITCSONS and A. VIKSNE. Devices for carrying bombs, etc. on and releasing them from aircraft. (371,876).

2,578. A. G. PETERSEN. Steering-control mechanism for aeroplanes. (371,922.)

2,496. WRIGHT AERONAUTICAL CORPORATION. Shielding devices for electrical ignition systems. (371,892.)

5,471. P. J. PROKOP. Aircraft propulsion. (371,994,)

12,037. BLACKBURN AEROPLANE & MOTOR CO., LTD., and J. D. RENNIE. Stabilisers for flying boats. (372,082.)

14,010. A. V. ROE & CO., LTD., and R. CHADWICK. Aeroplanes. (372,100.)

14,011. A. V. ROE & CO., LTD., and R. CHADWICK. Aeroplanes. (372,101).

17,707. R. H. JARRETT-KNOT. Propelling means for aircraft. (372,134.)

24,293. J. PINTSCH AKT.-GES. Wind-indicating devices for aerodromes. (372,204.)

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